The Builder.

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THERE are many points in the position of the drainage question at Manchester, other than we have noticed,* that are interesting and important. The Bridgewater Canal is supplied by the river Medlock; it is stagnant, and more offensive for miles than one of the London sewers. The "entire volume" of the Manchester streams was correctly described by Mr. Rawlinson, in his Report on Altrincham, about the year 1850, as "one mass of fermenting corruption for fifteen or twenty miles down their course." The water is used by bleachers, printers, and dyers; and the refuse from their works is ejected into the streams. Thus, the tainted water is again used for condensing and other purposes in steam-engines, and is discharged, heated, back into the open or covered water-courses which receive the drainage of the town; "so that a semi-liquid compound is formed, an accurate idea of which no written description can convey." Mr. Rawlinson continues,—"A thick scum coats the surface, upon and over which birds walk; the putrid carcasses of dead animals, dogs, cats, &c. float and rot in the midst; fermentation takes place rapidly, as large bubbles of gas may be seen escaping, and a thick vapour constantly hangs over the entire area." * * "When a full water-supply is carried out, and water-closets have become general, some terrible loss by disease may certainly be anticipated, should the present condition of things be continued."

This description, though, as to the worst features, applicable chiefly to the Bridgewater Canal, gives a fair representation of the state of the *streams*, and as they are to this moment. Indeed, the water in the Irwell appears much less in volume than formerly,—though floods are said to be greater. One reason for this latter circumstance —whether the true one in the case or not—seems to be well deserving of consideration. It is that, by improved land drainage, water now reaches a stream quickly, causing a sudden rise,—instead of gradually, so as to maintain the stream at an equable level. The rainfall sooner gets to sea, and the stream remains low, for a longer period. Further reasons are given for the extraordinary rise in the water of the Medlock, in August, 1856, and August, 1857,—when great damage was done to property, leading to legal proceedings against the corporation of the borough. The Manchester and Salford Sanitary Association, to whom the thanks of the inhabitants are due for the diffusion of much information, recommend that the course of the Medlock should be modified from the present circuitous channel; that angles in the side walls should be avoided; that the bed of the river should be paved, with a dip to the centre; and that a certain weir should be removed, or re-constructed, to facilitate cleansing; and they refer to the raising of the beds of the rivers by solid refuse thrown therein, and to encroachments on the banks, as amongst the evils which could be remedied were the conservancy in the proper hands. As to the sewage question, they consider they have demonstrated by experiments which they performed at the Bridgewater Canal, near the mouth of the Medlock, at a foul place to which reference has been made, that the sewage matter in suspension and solution in a running stream, can be precipitated by the lime process, at a comparatively trifling cost; and that much of the injury arising from the use of the rivers as common sewers, may by such means be prevented; and in the "Minute," of October 26th last, whilst their committee "have no doubt as to the vast importance of preventing the admission of sewage matter into rivers;" they say they had "recommended the precipitating process, both from economical considerations in relation to an evil already existing, and from regard to the urgency of the subject in a sanitary point of view." On such recommendations, the town council seem to be now seeking from Parliament the powers referred to in our former article.

It may, therefore, be presumed that the intention in Manchester is to carry out a particular application of the lime process on a large scale; and there are many points of interest as to the mechanical contrivances apparently contemplated, that will call for the attention of those who are interested in the general question pertaining to London. It does not appear that the Manchester experiments have attracted much attention from the Government Referees; at least we find no evidence of it in the Report and papers. The experiments seem to have been suggested subsequently to the reading of a paper by Mr. F. Grace Calvert, in which he put forth a method for facilitating deposit from the Medlock, in the curves in its course, using lime as the precipitant.

The chemical part of the investigation and laboratory experiments were conducted by Messrs. R. Angus Smith and A. M'Dougal, and Mr. Calvert, at separate periods; and the apparatus used at the canal, consisted principally of a trough with perforated bottom, extending across the stream, at an elevation of several feet above the water. The full effect of the application of lime was not ascertained—owing to unavoidable defects in the experimental arrangements; but it was found by Mr. Calvert, that taking the *organic* matter *in suspension and solution* as 12·11 grains per gallon, there remained, after treatment by lime, only 3·5 grains per gallon *in solution*,—"a quantity less than exists in many river waters which are used for domestic purposes." The lime process, it certainly appears, would put a stop to the putrefaction going on in the Medlock and canal, and remove the noxious gases which are evolved. On the occasion of the experiments, this was strikingly shown by the change in the atmosphere of the warehouse over the deposit basin. As to the proportion of lime, three hundred-weight per million gallons were sufficient; but it was found that the same lime would do duty four successive times, with little difference of effect. Mr. Austin, in his Report on Deodorizing and Utilizing Sewage of Towns, referring to these experiments, without questioning their value, indeed considers that they will form "no criterion of the quantity" of lime required for "ordinary sewage water." The precipitate has a certain value as manure, but would not bear much cost of carriage; yet it is more valuable and agreeable to use than the town's refuse,—at present sent as far as Lincolnshire. It is observed by Mr. Calvert, in a paper in the *Chemist*,* that the plan could be easily applied to smaller streams, such as those flowing through Bolton or Oldham,—a consideration of particular moment, bearing in mind the facts referred to in our last article. The purification would prove of great value to manufacturers who use the water. The process does not leave an increase of mineral matter; but it removes portions of the substances which form incrustations in boilers.

The contrivance which Mr. Calvert has proposed, consists in the provision of small tanks—the size and position of the beds of natural deposit near the angles and curves; and, at several hundred yards higher up, in placing across the stream, barriers, with openings to allow the flow of the water, whilst the barriers would retain a layer of lime, the thickness and renewal of which would be regulated. The matter in suspension in the water, after coming in contact with the lime, would be carried on and deposited in the still-water line, or in the subsiding tanks in that position. The idea obviously occurs, that a process recommending itself as this appears to be doing, to the people of Manchester, might be usefully applied to the existing sewers of London,—not with expectation of commercial gain, or as a perfect measure, but as some alleviation of the evils that are now endured, or which await correction from works that will be some years in course of execution. The Manchester Association consider it as proved, that the canal could be purified at an annual cost of 300*l.* or 400*l.* It would be confessed that the plan of removal now adopted in Lancashire, is in its nature, not the most scientific that might be devised.

The expense to the city of Manchester, of all cleansing operations, we are told, is about 7d. a-head, or, for 250,000 inhabitants, a total of about 9,000*l.* In the Dubinfield Report, we observe several references to the difficulty of getting the pits emptied, and of finding parties willing to take the soil. In Manchester and Salford, the circumstances may be more favourable: market-carts which would be returning to the country empty, are able to carry back a portion of the refuse; yet, we have seen that there is no gain commercially. In London, in the case of one particular district, a similar circumstance as to the carriage of the stable manure, was found to diminish the value of refuse in the liquid form; and the Stanley-bridge Works for irrigation by sewage, became a failure. Yet, as perceived in all the recent reports and documents, utilization in the liquid form, offers the only prospect of meeting the difficulty. Fortunately, the causes of the ill-success of the works just referred to, are understood, though the question has suffered from the discouragement of other attempts.

Mr. Samuel Brooks, in 1854, being anxious to have the question of utilization cleared up, wrote to the Town Council of Manchester, offering 1,000*l.* to be expended in premiums, plans, and inquiries; but we have not heard whether any advantage was taken of the offer.

The land of Mr. Carus Worsley, at Rusholme, near Manchester, is irrigated with part of the sewage of the village; where, however, the house-drainage is very partially on the metropolitan system. Mr. Austin considers "these works are interesting as an example of how small a place it may be worth while, as a profitable investment, to lay down pipes upon, and even to erect engine-power, for the purpose of getting this manure on to the land," adding that the quantity of sewage delivered "was equal only to the ordinary discharge from 150 houses." We have found at Rusholme that the outfall into the brook is still preserved for use,—as the irrigation does not go on in frosty or wet weather. A similar cessation in the work takes place elsewhere (except at Edinburgh); therefore the question as to London, and entire dependence upon outfall on to the land, is scarcely answered.

It would be well to inquire carefully into the effect of the soil and grass as deodorizers. Mention is made by Mr. Austin, in several cases, of the smell arising where land was in process of irrigation, though by him it is attributed to mismanagement, or faulty contrivance in the

* See page 717, *ante*.

* June, 1856.

open ditches. Mr. Caird, in the article, "Irrigation," in the lately published volume of the new edition of the "Encyclopædia Britannica," appears to us to show that the irrigation, on proper soil, must involve deodorization. Land in the neighbourhood of Manchester, manured in the ordinary way, is, we believe, found more offensive than that which is irrigated with sewage, whilst the former mode of application is costly as to labour, is inferior in the mechanism of application to the grass, and permits the use of much that is mere rubbish, found in the contents of ash-pits.

The object of future works of sewerage in Manchester should be, not only to free the streams from the present filth, but to provide sufficient outfall for house-drainage on the approved principles. The work to be done is in many respects peculiar to the district, and will be attended with difficulties as great as those of the drainage of London. We have thought that some hints, useful in one case or the other, might accrue from a comparison of the circumstances and requirements of the separate localities.

FONT COVER, FROM THE CHURCH OF "ST. ETIENNE DES TONNELIERS," ROUEN.

A century has not elapsed since the church of "St. Etienne des Tonneliers" was still erect, and displaying in its exterior the marvels of its architecture—fine florid Gothic of the end of the fifteenth century,—and sheltering under its graceful vault, in the mysterious light of its stained windows, a large number of decorative adjuncts.

In 1792, this church, like many others, submitted to the terrible necessity of the moment: its doors were closed, and its furniture put up to auction, to increase the treasure of the nation. Afterwards the edifice, become insecure, disappeared itself.

There is in the Library of Rouen an old print, well detailed, which displays the originality of this building. De Jolimont, also, in his "Edifices de Rouen," in the sixteenth century, gives a drawing of the church.

The font cover, of later date, is, perhaps, the only object of art remaining of this building, and is now in the Baptismal Chapel of the Church of St. Romain, which abuts upon the Rouen Railway. It is of octagonal form, made of carved oak, and in perfect preservation; is composed of a spherical pyramid, upon a rectilinear base, each face of which is filled with a subject taken from the life of Christ. All these subjects are well composed, and executed with great delicacy of chiselling.

Above is a quadrangular lantern, consisting of four detached columns, forming an order of architecture, terminated above the entablature by a little dome, crowned by a pelican. In the space between the columns the artist has carved a representation of the Resurrection. The carving of the whole shows great spirit, is in most excellent preservation, and bears the impress of the sixteenth century. The Archæological Museum of Rouen possesses a cast of this font cover, very skilfully executed.

A PEEP AT PARIS.

Paris is decidedly one of the most beautiful of modern cities. Since the last revolution, the pulling down of old, narrow streets, and building new ones in their stead; the planting of more trees in the frequented avenues; the completion of the union of the Louvre with the Tuileries; the addition of squares; the placing of more statues in the niches of edifices and in public walks, have quite changed the face of things, astonished foreigners who knew Paris a few years ago, and surprised even the Parisians themselves. Animated by this movement, the city has acquired a new degree of interest. In this movement there were needed great men, and works directed to really useful and ornamental purposes; and under the empire of Louis Napoleon, progress has been the order of the day; vast projects which for some years had lain dormant, have been achieved; a strong tendency to advance has shown itself in many sanitary improvements, whilst the example set by Paris, several other cities of France have followed. It is most interesting to observe the perseverance with which artesian wells are worked; to see the monumental fountains erected over them. Artois, Chaillot, Austerlitz, Belleville, Grenelle, and Passy are celebrated for these costly works. The engineers and surveyors of bridges and highways have many difficulties and embarrassments to overcome in penetrating to the required depth through numerous hard substances, through quarries of flint and stone; but all these seem trifling compared to the success with which their operations are generally crowned. The steadiness, yet the despatch with which old buildings, sometimes of great solidity, are levelled, and as quickly replaced by others more suitable to the character of the present epoch, is almost incredible. Few of the chatelets and castle-palaces of the ancient kings of France now remain; however, these vestiges of Old Paris are seen here and there offering a striking contrast to the architecture of the New Paris, and looking as if Time spared them for posterity, and made them too venerable for modern improvements to destroy. Many of the antiquities of this country have been preserved in the *Musée des Monumens Français*, founded in 1793, chiefly with the view of doing service to art, and of illustrating, by means of the monuments, sculptured tombs, and bas-reliefs of different ages, arranged in chronological order, the history of France and the history of French art. Lenoir was the founder and manager of this useful and interesting Museum. Among the French, there are some who in their national vanity choose the Ile-de-France as the cradle of Gothic architecture. But it is a more general opinion that the arts were imported into France from the East. The same forms of arches, and mouldings, and enrichments are found in the East in monuments still existing, and which date several years before the great church constructed in the Ile-de-France. Thus the famous Sainte-Sepulchre, built by Arabian workmen, dates nearly two centuries before the great Gothic church of France, and has been cited by many as a very beautiful type of Gothic architecture. The French, however, have done much to promote this style of late years, by building a number of Gothic churches in different dioceses. With them at the present day, as in our country, it is the popular, the universal, the religious art. We shall look at two or three of those ancient edifices in Paris which have been restored, are still being restored, and which it will take an immense expense of labour and material to complete. Among the religious edifices in the ancient Gothic style of Northern France, Notre Dame claims our first attention, as one of the finest specimens of the architecture of the Middle Age. When we have examined the construction of this cathedral, which was the uninterrupted labour of nearly 300 years, and which is entirely built upon piles; when we have examined the general disposition of the plan which is just and noble; the proportions of the different parts to the whole, which are satisfactory; when we have seen how admirably all the essential parts have been employed according to the principles prescribed for them; how perfectly the means are adapted to the ends intended; how much diversity without confusion, consequence being given to important parts, and inferior or smaller being subordinate; when we see what a rich imagination has embellished the edifice, making it at once pleasing to the eye and instructive to the mind; giving real beauty to the curvilinear forms and lines which naturally arise out of construction, as the ribs and bosses of the vaulting, the pendants, the pinnacles of the buttresses, the crockets and finials to the pinnacles, the tracery to the windows, the ridge ornament to the roof; when we see every niche, canopy, tabernacle, and hollow moulding in the arches of the doorways and galleries filled with statues, emblems, and Scriptural subjects; when we trace the number of ornaments and reliefs bestowed upon it, within and without, calculated by their arrangement to produce the greatest effect; the variegated dyes of the interior, heightened by "storied windows richly dight," blending and harmonizing with united splendour over the whole; we feel the chief object of the architects of such a pile, after it had been well constructed, was to carry it to the utmost perfection, to engage all the powers of form and colour for it to attain a high expression of beauty; to render it, by all the means of decoration, as splendid as possible. Some persons do not approve of this profusion of form and colour; but, on the other hand, the ecclesiastics, who in former times were generally the architects of churches decorated in this manner, and the monks, who devoted nearly the whole of their lives in illuminating the missal, thought it only proper to render glorious by similar means the edifice devoted to worship. We shall find that the system and principles which they pursued, subject to improvements the result of experience, have been to a greater or less degree adopted in the most beautiful churches in the world. Besides, can any one invent a better method, or improve on the plan of fabrics so perfectly adapted to every requirement of the church? We need not go farther into history than to remark that the taste for colouring the monuments of sculpture may be traced to the first epochs of monarchical government in France, and was propagated until the sixteenth century. It was but an imitation of the Greeks borrowed from the Egyptians. In truth, it is to these ingenious decorators—to the frescoists, mosaicists, polychromists—of those early ages, that art in relation to religion is so much indebted. Many of the wondrous stained-glass windows of Notre Dame have been repaired more than once; in 1752 by Pierre Leviel, who wrote a treatise on the art of glass-painting. At present M. Lassus has been charged to repair them, and to adhere to their original character. When the restorations are completed, Notre Dame may look like what it did in the thirteenth and fourteenth centuries. The façade, or west front, is restored; the kings have resumed their places on the pedestals from which they had disappeared; the three portals are again surrounded by a zone of crowded sculptures. If we examine the mystical character of this and other cathedrals on account of the ornaments that were employed symbolizing the doctrines of the church, as the vine, the ivy, tigers, lions, serpents, and the signs of the zodiac, we shall find that these figures form the principal decorations of all the ancient basilicas and churches. The western doorway of Notre Dame is charged with a zodiac, as is that of Rheims and S. Denis, without extending the list by mentioning other great churches on the Continent. But, whatever the nature of the figures sculptured in the stone of these piles, they were not the creatures of mere fancy or caprice, but every one had a meaning, an aim, and expressed some religious thought, although to the ignorant many of them were enigmas. When the ancient chiselling, fine incrustations, and colour are restored in Notre Dame, it will no doubt exhibit polychromic architecture as in the glorious days of Mediæval art.

The Sainte Chapelle, not far from the cathedral, and near the *Quai-aux-fleurs*, is one of the wonders of Paris. It was begun about the year 1245, from the designs of Pierre de Montreuil, the architect of the castle at Vincennes, and the refectory and chapel of the Virgin of the Abbey of St. Germain-des-Prés, which for its size and beauty nearly equals that of Sainte Chapelle. Sainte Chapelle is not great, but it is much admired, and affords a proof how much sublimity may be attained even with small dimensions. It will not yield in beauty of its kind to any of the most famous churches of France. Its construction is not a little remarkable. It consists of an upper and lower chapel; the latter at present is an *atelier* for the restorers, sculptors, and glass-painters; but a spiral staircase in one of the towers conducted us to the celebrated chapel, where a profusion of splendour almost dazzles; where very magnificent painted glass windows, of the thirteenth and fifteenth centuries, throw their magical tints over the interior, exceedingly rich with colours and gold; the ribs and stars of the groining are picked out in vermilion and gold, on a blue ground; much of the surface is sown with *fleurs-de-lis* in gold, as was a common habit at the time in royal and religious buildings. Nothing can be imagined more elegant than its golden spire, most carefully elaborated, rising from the high roof and glittering in the blue sky.* It has all the delicacy we see in goldsmiths' work. It has been thought that Raoul, the goldsmith, directed the execution of the ornaments. However, we cannot observe the finish of its details without appreciating the taste and the degree of perfection to which in those days they had brought architecture and sculpture. This architectural gem St. Louis purchased for placing in it certain relics he collected in Venice and Palestine. They had not yet begun the mosaic pavement. The restorations directed by Leduc and Lassus evince great care, patience, and skill. To pass from this edifice to its neighbour, the Palace of Justice, built from the designs of Antoine, in the plain, robust character of the Doric, is very striking, from the different impressions which each produces. The sudden transition from one to the other is extreme. It was erected in 1622; a previous one having been destroyed by fire. Its character is imposing and well-sustained, consisting of a large hall or court, vaulted in solid stone, surrounded by corridors, supported by columns, and lighted by well-placed lunettes; the arcades, staircases, and courts of law, are all well constructed in solid stone. The whole has that grand and lofty appearance which the Doric always has when well treated, and which, more than any other order, retains the charm of its primitive simplicity. The masses are kept large and unbroken, and the superiority of the workmanship and material (the former surpassing the latter) excuses some little faults that occur in the details. A simple, regular, and but little adorned structure like this cannot have much attraction for exclusive admirers of the beauties of the Gothic as exemplified in the Sainte Chapelle. Contrasted with the latter, the architecture of this palace, cast in a sterner mould, is, perhaps, seen at a disadvantage: the one is composed chiefly of curvilinear forms, the other of rectangular; though each has its peculiar merits, its own principles; and all that criticism has to do in such a case is to see that the principles which should govern each are duly applied. We do not see any points of resemblance by which these two productions can be com-

* Illustrations have been given in our pages of this and other buildings named.

FONT COVER OF THE CHURCH OF "ST. ETIENNE DES TONNELIERS," ROUEN.

pared. It seems very necessary to judge of different buildings, each presenting a style of composition essentially different, after those rules which have been followed out in them, and not to judge after our own rules. It seems necessary to have just and precise ideas of the relative value of different forms and proportions of different buildings, whatever the end to which they are destined,—

> "Whether the broad-brow'd tower that dares the sky,
> The hall by Commerce or by Science trod,
> The palace-home of kings, or solemn house of God."

Crossing Pont-Neuf, of which Giacomo Androuet was the architect, *temp.* Henry III. we admire, on the raised terrace which juts out from the centre of the bridge, the garden and the trees, forming in the summer season a picturesque group, viewed from the Pont des Arts and other points of the winding Seine. The pedestal of the equestrian statue of Henry IV. which was damaged in altering the pavement near its basement, is being restored. The first stone of this monument was placed here in 1818, along with a copy of the *Henriade*, richly bound. The statue was cast in bronze by Lemot. We now come to the lofty Gothic tower of St. Jacques, once part of a church demolished in the Revolution, and which has recently been restored. Houses which a few years ago abutted on the lower part of the tower, and scarcely admitted a ray of the sun into the street, have been cleared away for an open space of ground planted with trees, and laid out with curved walks, and flower-beds bordered with ivy. It is to the tired pedestrian quite an *élysée*. Here, as in other gardens and squares, in imitation of the London squares, the English style of gardening has been adopted; the straight monotonous lines and parallelograms once so common, have been banished; and the beds for flowers and shrubs take the more pleasing shape of a bow, a water ornament, a heart, or a *fleur-de-lis*. This is, in some respects, and under some circumstances, an improvement upon the manner of gardening, invented by Lenotre, which has been disliked by many on account of its extreme formality; yet he was the man at that time, who embellished the residence of kings, and there was a magnificence of ideas in his plans, as developed in the gardens of the Tuileries, the terrace of St. Germain, the park at Versailles, and the Trianon. We will now go by railway to Saint Denis, and see its venerable cathedral and the royal mausoleum, just outside the fortifications of Paris. The exterior of St. Denis is much surpassed by that of Nôtre Dame, Rheims, and Amiens. Restorations have been going on here for many centuries, at different epochs, and under different epochs, and under different dynasties. The crypt, which contains the tombs of the kings of France, is quite a museum of sculpture. It is worth while consulting Lenoir's work on these ancient tombs, which he has classified and arranged in the order in which they were executed. The crypt of St. Denis, the apsis, nave, aisles, and chapels, form quite a studio; art may be learned here theoretically as well as in an *atelier*; the interior, which they are making as splendid as possible, will perhaps exceed that of Notre Dame. We cannot say much in favour of the style of some of the architecture, which is a kind of Lombard Gothic,—of which there are many specimens built in France and in Germany, by Clovis and Dagobert. But architecture made some stepstowards the beautiful after the second race of kings, in the ninth century, judging from the Abbey of Cluni, built in 810. Félibien, in his "Lives of Celebrated Architects," says that Abbot Suger ought to be considered as one of the most intelligent men who lived in the twelfth century. He repaired and enlarged Saint Denis, took upon himself the principal share of the work; began it towards the year 1140, and finished it in less than ten years with an extraordinary magnificence, as may be learned more particularly from his own description. On the return of the Crusaders, towards the end of the thirteenth century, many of the decorative arts were cultivated; and the artists who had accompanied Louis IX. in his voyage to Asia brought home with them a style of decoration unknown before, and introduced into architecture arabesque ornaments. Real taste was apt to be sacrificed to too great a love for these ornaments, and was prejudicial to the more genuine Gothic architecture of that period. At present, some of the side chapels, the shrines of the ancient kings of France, are very splendid, from the rich colours that cover the walls, from the sparkling dyes of the windows, the golden ribs and bosses of the groining, which is starred on a blue ground. The suspended lamps, the inlaying, the capitals of the columns, the canopies in which stand the kings, arrayed in their robes, holding their sceptres, and crowned with their golden crowns, enable the visitor to form an idea of what the cathedral will be when completed, for the whole of the interior is to be worked up to the same degree of brilliant effect as seen in the side chapels that are finished. We asked a Frenchman who accompanied us, what he thought of it. He said, "it is *bizarre*, a hideous *charivari* of colours, *trop parée, trop recherchée, et ornée à l'effet.*' Another replied to the same question — "It is too beautiful—it is extravagant; one utility in it is that it employs artists and workmen: better have days for restorations than days for mutilations." Let us now return to Paris, and conclude our remarks on another style of buildings, and a later age, taking the churches principally, for of all public edifices, they most strongly attest the state of art at the time when they were constructed. In the churches of the *ancient Gothic style*, we might have included in our description, *St. Germain-des-Prés* (now being restored), *St. Etienne-du-Mont*, St. Gervais, which were built about the same date, and bear many points of resemblance to each other; though the Sainte-Chapelle du Palais was the most elaborately wrought of all. When we look into the architecture of Paris, we frequently find that incongruous mixture of styles, which often occurs to mar the finest buildings, from the fact of their having been built at different periods, and by men seemingly determined to show their contrary ideas and tastes. It has been the fate of some of the noblest edifices that were ever reared to have passed through the hands of several architects who have not co-operated towards one great

and important end, unity of style, but have sacrificed it to the vanity of their peculiar fancies, in consequence of which, the pleasure and improvement that might be derived from such edifices are much diminished. It would seem that some architects tried as much as they could to alter or to distort the first plan and order adopted by their predecessor. This is observed in many of the old churches in Paris that from time to time have undergone repairs. The Roman arch or the horizontal beam is found alongside the Gothic. Saint Eustache offers an instance of the Gothic and Renaissance in close and ill-assorted juxta-position; a number of details from the Greek and Roman orders, and ornaments very fine and delicate, but not Gothic, obtrude themselves amidst the ancient Gothic. Some of the sculptured works of the sixteenth century, as seen in the tombs of St. Denis, by Richier, and Germain Pilon, opened a new era for the statuary art in France. The French school was founded by Jean Cousin, in 1540; but it was towards the middle of the eighteenth century that France derived great advantages from her wars with Italy; and Paris became enriched with monuments of art, the spoils of Rome and Italy. These wars gave her a knowledge of the principal works of that artistic country, and had a powerful influence upon the architecture of Paris. To be convinced of this we have but to acquaint ourselves with the best works of Perrault, of Pierre Lescot, Levau, Bullant, Philibert Delorme; and, later, those of Antoine (the Hôtel des Monnaies); Jacques de Brosse (the Luxembourg Palace); the Sorbonne, by Lemercier; the cupola of Val-de-Grace, by Lemuet; the triumphal arch of St. Denis, by Blondel; Versailles and the Invalides, by Mansart. Among these are some of the finest edifices in Europe. Q. de Quincy, in his account of the church of Ste.-Geneviève, calls it a monument of its kind,—the greatest of the eighteenth century. It was the work of Soufflot. The church of the Invalides also is considered by Félibien, de Quincy, V. Cousin, and others as one of the most beautiful of modern Europe. Numerous artists were employed in constructing and ornamenting it. Bruant superintended the building at its commencement; Mansard raised the dome; Girardon, so much praised for his bas-reliefs and sculpture at Versailles and the Trianon, directed the sculpture; Martin, the Boulognes, N. Coypel, Jouvenet, &c. painted the principal parts. The idea of Napoleon was to remove all the infirmaries to a greater distance from the church, adhering to the original designs of Bruant and Mansard; to prolong the edifice into one vast cross, presenting four façades, like the existing great façade, having the dome in the centre. The Invalides had then been *un et unique*. Visconti, to whom Paris is indebted for some of her most graceful fountains, superintended the decorations of Napoleon's tomb. Though we have but glanced at some of the most beautiful objects in Paris, they will yet be ever engraven on our mind; and we say of them as to a friend on parting, *au revoir*. F. L.

HACKNEY AND HOMERTON.

The Rhine and Switzerland are more familiar to the dwellers in the western parts of the metropolis than are the lands which form the eastern districts of the same great city. It is a pity that such should be the case, for if but a small part of their spirit of investigation and travel were diverted by those of the west to the opposite parts, beneficial results would be the consequence. We have from time to time directed attention to parts of London which to many were as unknown as are the partially explored regions of Africa.

Let us now glance at Hackney, Homerton, and the other neighbourhoods which adjoin the marsh-lands. A line of railway skirts the north-eastern borders of London, and any visitor to the district to which we are bound may start from the City, or from Chalk-farm, Camden-town, Islington, or other stations, and the "iron horse," as the old locomotive was first called, will, in a very short space of time, convey the traveller to the Hackney station. The grey old tower of the church which formerly stood here is a pleasant-looking object, and tempts us towards the graveyard, which contains numerous memorials of the dead who have been interred here about a century. Some of those stones are illegible, and yet there are indications of the ornamental sculpture, which also is fast vanishing. Here and there it may be noticed that all traces of lettering have disappeared, and nothing is visible except a faint indication of some family crest: such objects remind one of the "vanity of vanities" of the "Preacher." The groups of trees, with peeps through of the old belfry, will please artists. It was a praiseworthy feeling which caused the people of Hackney to preserve this portion of their church, for already have nearly all the picturesque features of the buildings been removed. In the main street the gabled houses have been altered into more fashionable shapes. Plate-glass and other decorations have been brought into use. The building of shops on what were once the gardens in front of dwellings, and other usual works of progress are going forward. This neighbourhood is generally very open, and there are plenty of extensive green places left in all directions. The streets and squares have no architectural beauty. Many of the houses are of the unadorned style of the early part of George the Third's reign: they have a comfortable look, and convey a feeling of unpresuming respectability. Mixed with those are a few dwellings of date as old as Charles the First or Second's time, with nice iron railing and pollard-trees in front. There are also the City of London Union, the Hackney Union, churches, and some charitable buildings in this district which will attract notice.

Substantial and snug as is the general appearance of Hackney, it is, like other localities, unfortunately not without poor, neglected, and dangerous spots: we would mention, Hindle-street, Abbott-street, and Fairey-street, as places which require very great improvement: the drainage is bad, the closets are bad, the pavement bad. "The houses were, in fact, sir," said a tenant, "built with a prospect to sell:" and here is the sure result—small-pox very prevalent, and typhus fever common.

We had some difficulty in finding an "old inhabitant," many of the persons to whom we applied for information having only for a short time resided there. The general impression seemed to be, that the place was remarkably healthy. A gentleman who had resided in a confined part of Whitechapel, said that during his residence there he was scarcely ever out of the doctor's hands, and that since his removal here his health had wonderfully improved. After a careful inquiry amongst various persons, we hear of no particular cases of ague. In the Hackney Union, which contains the poor of a population of 63,000, there was but one case at the time of our visit which at all approached towards this complaint, so prevalent in parts of Bedfordshire and Kent. One of the medical attendants of this seemingly well-managed institution, stated that the neighbourhood had a high character for health: the water-supply from the East-London Company was good; and that as regards the exhalation from the marsh, he thought that the elevated position of Hackney and Homerton might in some degree cause it to escape the injurious effects. However that may be, it is certain that preventible diseases here are rather to be traced to the ill-drained spots than to mists from the marsh. In making this statement it must be borne in mind that the neighbourhood is open, and that even most of the courts of which we would complain are open towards the country.

"We are getting on here, sir," said an intelligent shopkeeper: "we are putting a new face upon things; but would you please to step to the back of my premises, and look at an old-fashioned nuisance, which I would be glad if you could assist me in getting rid of." Accepting the invitation, we proceeded as directed; and, over a paling, saw the Hackney Brook flowing amongst the houses, much in the same fashion as the Fleet Ditch did formerly at Clerkenwell. Into this "brook," or ditch, a considerable part of the drainage of Hackney and other places is passed. The condition of this stream should be considered, for according to present appearances it may be long before the great scheme of the drainage of the metropolis will be executed.

In passing over this neighbourhood, it is a pleasant sound to one's ears to hear that music of progress, the puffing sound of the locomotive, the breathings of which indicate wonderful and speedy changes in this and other metropolitan suburbs. Ere long we hope that the railways, and the advanced intelligence of the industrious classes, will lead to thousands of homes being made on open ground,—well-drained and wholesome places. Here, however, straight before us, spreads the marsh,—large fields of cabbages, onions, and other vegetables form the foreground, which is broken by trees, palings, and dung-heaps. When looking at this view, we thought that both De Wint and Cox might have picked up nice bits of scenery here, that would have caused many to exclaim, "Have we such pretty quiet scenery so close to London?" At the time of our last visit a slight fog hung over the land, and thunder-clouds rolled up in the distance. Seen under such circumstances, this large level space, leading towards the Thames, and reaching far in the opposite direction into the country, had a beautiful effect.

The river Lea and the water in the artificial cutting of the East London Water Company flow through the level part of the valley. Wandering towards Lea-bridge, where the new and extensive filtering works of the Water Company are situated, Hackney and Homerton are seen rising on a pleasant eminence on all parts of the ground which are at all raised. The houses are marching upon the marsh, and even down below, the bricks and mortar seem struggling to meet the neighbourhoods of Canning-town, &c. which are farther east. Amongst the unhealthy districts, Lea-bridge was mentioned, and to this spot, so well known by many a humble disciple of honest Isaac Walton, let us move on. This place is increasing, and before many years pass it will contain a large population. Independent of any malaria from the marsh, the position of this group of houses is such, that fever and other complaints may be easily accounted for. The Lea river, which passes through the place, is in its ordinary surface very little below the ground-floors, in which families sleep. The drainage is not cared for, although the stream runs close to many of the houses. At the last attack of cholera, there was only one fatal case at Lea-bridge, and that occurred in a house where the dwellings are placed back to back, and neither well drained nor ventilated.

The absence of hedges or walls is a peculiar feature of the marshes. The land is, however, divided by numerous short wooden posts, which separate the property. This large tract of "Lammas land" belongs to the parishioners of Hackney. The high lord, as he is called, has certain privileges, but from August to April the land is free to any inhabitant for the purpose of grazing cattle. During the remaining months the property is claimed by certain individuals who grow large crops of hay upon it. If our readers will take the map, they will perceive that several streams of considerable volume flow through: the chief of these is the river Lea. A few years since this river, into which a considerable quantity of sewage passed, was delivered unfiltered to the dwellers of East London.

Now, however, the water supplied by this company is brought by a canal, which draws the water from the river Lea at a considerable distance from town, where the water may be considered as pure as most country streams. The sewage of Tottenham, &c. is now intercepted; the river Lea passes through Lea-bridge; the other stream is received at the large works which have been recently put up by the water company for filtering and sending it to London as pure as may be. A very intelligent person whom we met with here directed attention to the difference of the water in the river and the canal, and remarked that he had formerly for many years been acquainted with the nature of the water supply delivered to the unfortunate dwellers of Lambeth and Vauxhall. From the Thames he has known the water which was pumped up to be so foul with the sewage that the smell was so bad that it was difficult to keep the men at work. It appears that by an enactment of Parliament they were obliged to pump at low water. Respecting this our informant said "Nothing could be worse than this plan; the water was little better than the Fleet-ditch, and this, with very little refining, was sent for men, women, and children to drink." Truly the water supply of a great city is a most important business—a matter of life and death to thousands; and it was with no small pleasure that we saw the means which are being used at Lea-bridge for purifying this important necessary of life. Here the water of the canal flows in continual stream into the large filtering tanks which are at work night and day, and it is a beautiful and most pleasant sight to look into the receiving chamber, in which the water is constantly in a condition fit for use. So clear is it, that the little fish may be distinctly seen at the depth of several feet. From hence the water is conveyed by pipes to London. A steam-engine of immense power assists in this operation: this is constructed on Bolton and Watt's most improved principle; and there is in most eyes something exceedingly grand in the slow, yet seemingly irresistible force of this monster, which, by the ponderous movement of a ram weighing over 50 tons, forces the water amongst six or seven hundred thousands of people.

ON THE FOUNDATIONS OF SOME OF THE METROPOLITAN BRIDGES.*

Waterloo and London Bridges, which were both built by John Rennie, have both the same kind of foundations. Waterloo-bridge, built in 1809 to 1817, has nine equal semi-elliptical arches of 120 feet span and 35 feet rise; and London-bridge, built in 1825 to 1831, has five semi-elliptical arches, two of which are 130 feet span, two 140 feet span, and the centre arch 152 feet 6 inches span, with 37 feet 6 inches rise: it is 52 feet wide, none of the other bridges, including Waterloo, being more than 45 feet wide. The foundations of both these bridges were constructed in coffer dams. Into the construction of coffer dams it is not now proposed to enter, their object, their purposes, and their details being well under-

* The following is a portion of a paper, by Mr. W. A. Boulnois, read, as already mentioned, at the ordinary meeting of the Royal Institute of British Architects, on the 7th instant. As we have recently trodden the same ground, some of the particulars given would be supererogatory.

stood in this room. The entire area of the bases of the piers is piled with elm piles, about 20 feet long and about 3 feet apart, and which penetrate the London clay, in the case of Waterloo-bridge probably to a depth of 18 feet, and in London-bridge about 18 feet 9 inches or 19 feet. On the heads of these piles were laid sleepers, and the loose earth between their heads was replaced with rubble concrete, on which blocks of Bramley Fall stone and brickwork filled up the spaces between the pile-heads, immediately below the platform of oak planking which carried the first course of granite masonry.

The pressure upon each pile in London-bridge has been estimated at eighty tons, or about five tons per foot superficial on the entire area, and this is considerably below what the piles would actually carry. The difficulty of applying sufficient dead weight upon piles, to ascertain their bearing powers in equilibrium, has always prevented the formation of any formula or data on which engineers can base their experiments. The piles are driven, and the pressure they must be sustaining is then calculated after the load is on, no maximum having been ascertained. At the border-bridge on the Newcastle and Edinburgh Railway, the calculation showed that each pile must be sustaining a weight of seventy tons. The pressure on each pile of Waterloo-bridge is probably somewhat less, but still it must amount to at least sixty-eight tons.

London-bridge has a close pile sheeting all round the platform, which penetrates about one-third of the distance of the main bearing piles. Waterloo-bridge does not appear to be so protected, yet London-bridge after the removal of the coffer dams settled in every pier from 6 inches to 10 inches towards the down stream: this was attributable to the entire area of the river substrata finding their proper bearing after the disturbances to which they had been subjected by the piling of the coffer dams and of the centrings. The coffer dam above bridge was in 35 feet of water below low-water mark, and the piles were consequently very deeply driven, and though those which were near to the piers, or could apparently affect them, were not drawn but cut off, the mass of the clay had received a disturbance which settled itself probably once and for ever, and if the bearing areas and the tenacity of the piles are sufficient for the superincumbent pressure, no further settlement need be apprehended.

Southwark-bridge, also built by John Rennie, was erected in 1814 to 1817: the spans are 240 feet in the centre arch, and 210 feet each side arch. The arches are segmental in eight cast-iron ribs, and rise about 22 feet. The two piers are each 24 feet wide: they were built in coffer dams upon piles which were about 2 feet 6 inches apart, or even closer, and 20 feet deep: the drawings, which I have been enabled to examine, represent about 286 piles under each pier: the platforms for the first course of masonry were made in a similar manner to those of London and Waterloo Bridges, and no settlement has taken place as far as I can learn, nor has any repair of moment to either sub or super-structure ever been necessary.

Vauxhall-bridge, by James Walker, was built in 1811 to 1816: it consists of nine segmental iron arches in ten ribs of equal spans of 78 feet, the rise being 11 feet. The foundations were laid in caissons, which were sunk down to the London clay, the river being dredged I believe in its entire breadth for that purpose: the footings are in stone, no subsidence has been recorded. I have not been able to learn the precise means taken to prevent the scour from undermining the caissons, but I believe the Kentish rag and ballast were thrown down around the piers in vast quantities.

Hungerford-bridge was built by I. K. Brunel in 1844. The foundations of the two piers which carry the chains, rest on a bed of gravel which is stated to be as hard as a bed of artificial concrete. No piles were used in the foundations, a coffer dam being formed round the piers, and the ground was excavated down to the hard gravel which was found about 6 feet below the then bed of the river. Below the mud (and until the hard gravel was met with) gravel of a looser kind was encountered. On the Hungerford Market side of the bridge at the mooring piers, the ground was very bad: piles were here driven to the depth of 30 feet. Mr. Brunel terms the beds on which the bearing piers rest, two oases of hard gravel (as hard as concrete) forming a natural formation, situated in the midst of a looser soil.

* * * * *

After this description of the different foundations of the piers of the bridges which are in existence in the river Thames, it will be seen that the conclusions which must be drawn from the practical experience of those foundations which have failed, and those which have not, are very limited, but they are at the same time very clear and simple: the bed of the river Thames is much lower than when the bridges which have failed were built—a fact occasioned by the increased scour produced by the removal of the dam which old London-bridge afforded—the contraction of the waterway by the projection of embankments, and though last, not least, the ballasting which for a long period constantly proceeded above the bridges, and though now to a great extent prevented, yet sufficient from the dredging operations as well below as above bridge to deepen portions of the waterway by some inches annually. This deficiency is not made up again by the deposit of gravel or ballast, for the deposit of the Thames is silt, sand, and mud; and the original gravel-bed of the Thames has been so reduced by dredging, and by the scour consequent on changes in the waterways, as to be now only existing in sufficient thickness to be built on in oases as they were termed by Mr. Brunel, such as the parts on which the Hungerford-bridge piers were constructed. Wherever, therefore, we find the foundations have been made to depend on the gravel, and have not been taken deep into the London clay, failure has taken place. The piers of Hungerford-bridge, the only exceptions to this rule, are so lightly weighted, and situated so fortunately for avoiding scour, and have been so recently constructed, that they cannot be said to disprove it. The rule of experience is, that in the clay only can a sure foundation be found, and no casings have yet been added to defective piers which have held the enclosed gravel into a sufficiently compact mass to prevent its sinking by loss of substance through the joints of pilings. Down to the clay, then, we must go for a sure foundation, and the different methods of effecting this are the only points for discussion.

The old successful examples in London are all of one class: they are coffer-dam examples, with the exception of Vauxhall-bridge and the new bridges designed by Mr. Page. Vauxhall bridge as has been shown, was a caisson foundation carried to the London clay without piling, and the weight of the bridge is not sufficient to need piling. All the other sound bridges are piled deep into the blue clay. The shoulders and sides of these piles, and the surface of the clay between them at their tops, are the ultimate bearing points upon which presses the superstructure, whether of granite or stone courses, or of compound concrete and wood, or of iron. Theory would say, upon this foundation make the superstructure as light as is consistent with even pressure and avoidance of jarring which may cause motion: every pound you place on the shoulders of the piles, or upon the earth's surface at their heads, beyond what is required for inertium, is useless and superfluous. To maintain the piers in perfect inertium, and immovable under the pressure of water, floating ice, or drifting sailing barges, or unskilfully directed steam-boats, and the heavy road-traffic over the bridge, requires a much less weight than would result in an equilibrium between the bearing surfaces and the pressure: it is not necessary to have solid granite from the bearing points to the voussoirs for equilibrium, and almost any materials that can be used are in the tidal currents of our river sufficient for this purpose. It is perfectly true that London and Waterloo bridges would be absolutely stronger constructions theoretically, if their piers were not so enormously heavy, and were built of brickwork, or hollow. * * *

With regard to the destruction of the foundations of piers in the river by scour, I think the ultimate depth of the scour will never, under any possible circumstances, extend sufficiently far down the piles of either London, Southwark, Waterloo, or New Westminster, to cause any apprehension on this score, and simply renewing the casing and filling round the piers with concrete will be enough to prevent their injury, should a tendency to scour be observed. The river has deepened only in places for some long time since its great deepening by the removal of London-bridge. When embankments are carried through on each side, as we must all hope they will be, and the channel narrowed, the equalisation of the depth will at that time prevent any serious increase of scour.

The methods proposed to counteract this effect by Mr. Cubitt and Mr. Hosking, would also prove effective to preserve bridges founded so deep as those piled into the London clay, though they would not probably have preserved either Westminster or Blackfriars. Mr. Cubitt proposed to pave the bed of the river with stones for a distance above and below the bridge of some 60 feet, I believe, as well as under the arches; and Mr. Hosking proposed a sub-weir of piles across the river to a height which should prevent the rush of water degrading the existing bottom of the river, and he showed that ample water would remain at low tide to answer every purpose of the navigation.

Le Creult, chief of the French Ponts et Chaussées in 1780, in his work on rivers, proves that the beds of rivers do not change sensibly when considered throughout their course, but that local causes alone occasion increase or decrease of depth in the beds in different places, and not throughout their length, and the Thames being subject to no violent floods, and having, on the whole, very steady tides, it is not probable that unforeseen and unpreventible injury should occur to deep-seated foundations, well protected in its bottom.

The inquiry into this subject has led me to seek information as to any failures from scour which have occurred to bridges abroad, and I cannot find an instance of a deep-piled bridge which has fallen: many have needed repair, and most of them have of late been strengthened by throwing in concrete round the piles, and no question seems ever made of the stability of this enclosing medium, or of its tenacity to the wood piles. Indeed, the employment of concrete by the French in hydraulic works is far in advance of our application of it hitherto. They do not scruple to use it without any encasement whatever in the beds of swift rivers subject to violent torrents during floods.

Upon the subject of the durability of the encasements of the piers at Westminster and Chelsea bridges there exists some difference of opinion: for myself, I think that if the hollow piles are filled with cement grout, they will, as respects the buried portions of them, be almost as durable as the other portions of the structure, and will be, as compared with past constructions, whether Pelasgian, Grecian, or Roman, indestructible; but as respects the portions out of the clay, unless some preservative is applied to them, they will not endure, probably, more than 300 years. It was Mr. Hawkshaw, I believe, however, in his evidence before the committee of the House of Commons on this point, who said that by the time that any decay of moment had occurred to the iron casing, the condition of the other portions of the structure would be so stable as to admit of its removal and replacement without [illegible] sider what has been done both at Blackfriars and Westminster, in the way of cutting at the old foundations, I have little doubt that these piers could be, with care, re-encased without any danger to the foundations, which it must be always remembered are deeper than the pile casings, and not above them, as was the case at those defective bridges. Screw piles might at any time be placed a short distance outside them without any risk from vibration or concussion in the strata.

THE GREAT CASE OF STUCCO *v.* BRAINS.

SIR,—It is a great pity that writers like "Aristides" will waste so much time and ingenious argument, through not first acquainting themselves with the most accessible and easily learnt facts; and though, as one of the butts of his mistaken attempts at wit, I might maintain a dignified resolve not to help him, I will, if you please, assist him to correct a fact or two, that will quite alter his whole data.

1. He must be quite a stranger to England to suppose we ever stucco buildings for the sake of "a cheerful and lively appearance." The idea has been broached, as I believe all those of "Aristides'" have, in your pages before, and seems thought a capital cement-maker's cry. A little stay in any of our towns, however, will show him that if any of their "cement architecture" approaches liveliness of colour, it is because it has received within a year or two a coat either of paint or some other dirt-hiding cosmetic, without which periodical sloughing or moulting (so "good for trade," and for some of the *Builder's* readers, at the cost of its non-readers), the "dirty-red brick" of our young friend's aversion—nay, even the more soot-retentive London brick—is so much longer growing thoroughly dingy, as to have actually the advantage in this point over any "cement" piece of art that Chancery or some corporate owners may have left as long to its own unaided cheerfulness. Now, whatever the object of these universal coats of drab or our national sacred "stone-colour" (a tint, by the way, that I do not believe people ever yet chose for cheerfulness, for I never saw it on any happy-looking village or good-old-time plastering; and the most lively-coloured town I ever saw, which is St. Thomas's, in the West Indies, has, or had, its wood and plaster houses of every light tint I can think of *except* this,—even Ruskin's aversion, buff, but not this holy drab): whatever their object, I suppose "Professor A." as a professor of the noble science of mud-spreading, knows that they might possibly be applied on other materials than cement; and even if they could not, if this ground for them must further of necessity cover the whole building, with every appurtenance required by its structure, and also every one proper to another whole imaginary stone building, and be "jointed to imitate stone" (as the specifications say); and further formed with vast contrivance (not the *architect's*, however) into the semblance of that other imaginary building, with capitals, architraves, and what not;—if all this is preparatory and accessory to getting a house lighter-coloured, I can only say we have realized the state of that fabled people who had no way but burning a house down to obtain roast pork.

2. "Aristides" talks of stone as "the best material," and "cement" as another, as if these were somehow interchangeable, or both fit for some common purpose, for which he mentions no other. Now, I believe that among the endless eccentricities of our great architects, there is *one* piece of work, a medical college in Lincoln's-inn-fields, where this substitution of *cement* for *stone*, as a building material, has been tried; but the common practice of mankind in every place where stone is not at hand, has uniformly confirmed the old choice made at Babel, of *brick* for its substitute, and not *cement*. I am quite ready to admit, on valid proof, that all this is overturned by the above innovation, or by Paxton's; but our friend is arguing about *present* materials.

3. There is no "cry against cement" that I am aware of. The "puritanical" cry that "Aristides" and his whole craft will yet find too strong for them, is only for the right thing and person in the right place, and no mimicry of one by another; a designer at the drawing-board, for instance, and not a sneaking mimic of a man-milliner, with stone and brick for lace and crinoline.

4. Whether "the coat on a man's back is a sham" depends on whether it is so designed as to pass for a coat, or for something else. We applaud in their right place, coats that represent well a suit of armour, or a man's skin, or a dragon's; but I never heard of a gentleman wearing them, and in the street. Now, just as little does any Englishman, or body of Englishmen (except perhaps the Puseyite clergy) desire their building to pass for aught else than it is, or their building's *coat*, when it has one, for a *building*. But this, our poor deluded Mr. Bull is obliged to have all his work to do everywhere and make his entire cities, if not country, masquerade-rooms, to the laughter of all neighbours (save his own child Jonathan) and the illimitable absorption of degraded labour into the abyss of ephemeral millinery; all forsooth, to keep up the pretence that certain "*per-centage-on-the-outlay*"-*taking* agents are fine-artists. This is the only downright wicked "sham" in the case. Sham *buildings*, for their own sake, would be merely childish and laughable, not immoral. Are we to be told *these* are an object, either with the "architects" or the public? Coats on buildings have been used everywhere 5,000 years, without its ever occurring till the last 50, or perhaps 100, to pass them for no coats, but for buildings. Now, to make them good and sightly coats, whether in stone or cement, as at Florence Cathedral, S. Sophia, or even a mediæval plastered inn, required some, however little, of the designer's *own work*: but to mould them into the ready-made forms of finer uncoated buildings, perfectly, even to the "jointing," requires only *other people's*. Is it a very singular coincidence that this is all poor Mr. Bull can get, from men paid not by their own work, but a per-centage on other people's? Is it at all singular that from such a "profession" he finds he *can* get nothing else, fret and fume and proscribe this or that "sham" as he may? Nay, for the sake of this, he *must* have skins on his buildings, stone or stucco, whether wanted or not, from the gin palace to the palace of Westminster and British Museum; and the stucco ones, by far the lesser sham and less harmful. He must have them for the sake of the forms they can be made to mimic, though this was no more thought of till the days of *outlay-paid* architects than crinoline before there were outlay-paid milliners. Cure their root, and they will all cure themselves,—never otherwise. "Aristides" and his fellows are the only shams to be eradicated: it is useless as well as puritanical to cry against cement.

5. We are told this is "one of those virtuous notions which every one re-echoes, and all practically disregard." Will Aristides be pleased to show us where the late Pugin, or Messrs. Street, or Woodward, or Seddon, or Scott have disregarded it? If not, here are three facts he mistook in a breath:—(1) There is no such "cry:" (2) though none re-echo the "notion," many *do* practically regard it; and (3) it is no "virtuous" notion, being the easiest possible to carry out by good or bad, real or unreal, designers alike.

6. The "cry" might actually lead us to a ceiling "showing the timber joists. Such are the absurdities to which," &c. Oh! absurd world and miserable mankind, to have lived some 5,000 years in such absurdities! Happy nineteenth century, to be delivered at length from the perpetual sight of absurdity! And yet those dolts, the painters, actually still imitate this, expect us to take pleasure in the disgrace of our ancestors, and show us kings and heroes sitting under the absurd joists! No wonder the Royal Academy excludes architecture: Aristides explains it all.

7. What Goth can have told him that the "*use* (of cement) in their style would be monstrous"? In their style indeed, if the middle ages are any authorities in it, all cement had the barbarity to show itself openly to be cement (and that managed by an original designer), and not stone, masonry, mouldings, carvings, and buildings. Which is the more "monstrous" may admit two opinions. Perhaps, however, those ages are not so great an authority as Mr. Scott, for I hear rumours of his discovering in poor harmless-looking silicate of lime "an accursed thing." Now I must apologize for quoting this once, in Aristides's own way, at second-hand. I had promised myself the pleasure of reading Mr. Scott with care; but a certain late sermon or lesson in Westminster Abbey changed my mind. I had gone to hear Dr. Wordsworth, but was first struck with some odd derangement of the building's light, from that fine distribution that has chiefly, or perhaps solely, given it its peculiar solemn beauty, as the *only* dignified church-interior in London, and I believe the *most* so in England. That decided predominence (as in a French cathedral) of the central light over that of all the aisles was gone, and the latter glaring as in a modern church, as if the aisle windows, so long before our time cleared of all beauty and art (to the admission of about four times the light they were intended for), were now even enlarged. However, I saw no change in *their* shabby casements, but far overhead in the "clear" story, found five windows filled up with either deep and heavy-coloured glass pictures, or Turkey carpet designs (for you must mount at least to the triforium to ascertain which); but apparently elaborate pictures, which, if fit to be seen, would be the exact things wanted in the aisle windows: so that I presume they are not worth much, or would not be put (in a building only 30 feet wide) just 100 feet above the spectator, where they can be just as well understood as in the lantern of St. Paul's; nor used as sun-blinds, a purpose served as well by a little rough plate-glass (to say nothing of the light artistic mosaics of the Cologne and other clear stories): nor so as to defeat the whole purpose for which the said *clear* story was built; and, if they are continued, to reduce the poor old building at last to the vulgar English type of a church, *lighted from below*, which is utterly fatal (as Mr. Fergusson says), to all dignified effect. I looked again at the woful aisle windows, and thought life is really too short to be squandered in perusing men's opinions who can do such things as these; so I came out wiser, and have not read Mr. Scott, any more than I should go to learn mechanics of the engineers of the *Leviathan*. His works would probably yield me new and valuable truths; and so may any fragment of print that we tread into the mud, but it becomes impossible in these days to carry out the Mussulman rule of leaving no scrap unread that may contain some word of Allah. Assuming that Mr. Scott is rightly quoted then, I should say he ought to have looked more than whitewash-deep for the "accursed thing." Whatever materials, or practices either, you may proscribe, others as vile and delusive will immediately arise in a subtler form, and you will find only false and delusive design is to be had after all from a delusive profession, from outlay-paid (that is, paid for other men's work) designers. E. L. Garbett.

INSTITUTION OF CIVIL ENGINEERS.

On the 15th inst. the general annual meeting was held, Mr. Stephenson, M.P. President, in the chair. The report of the council for the past session, which was read, referred to some of the more important engineering works in progress or recently finished.

Among the works in an advanced state, the bridge erecting by Mr. Brunel, V.P. on the Cornwall Railway, for carrying the line across the River Tamar, at Saltash, near Plymouth, was prominently alluded to. This bridge, including the land openings, would be about 2,200 feet in length, and would consist of nineteen openings, two of 455 feet span each, and the others varying from 70 feet to 93 feet in span. The latter were formed of simple wrought-iron girders, but the two main openings were to be spanned by longitudinal beams, suspended by long-linked tension chains, rendered rigid by vertical struts and diagonal bracing, from arched tubes of wrought-iron plates. The transverse section of these tubes was elliptical, the horizontal axis being 16 feet 9 inches in length, and the vertical axis 12 feet. Each tube with its chains and suspended roadway would weigh about 1,080 tons. The first was floated on the 1st of September of this year, was conveyed upon pontoons to its site, and was placed upon the piers in about two hours. It was now being lifted by hydraulic presses, and the process was progressing very satisfactorily.

The Rivington Waterworks of the Liverpool Corporation, constructed by Mr. Hawksley, M. Inst. C.E. were brought into operation in the early part of the present year. The works consisted of several impounding reservoirs, two of which had embankments of nearly 100 feet high, and two others with embankments of about 50 feet high. These reservoirs held about three thousand two hundred million gallons, and were intended to deliver about fourteen million gallons daily to the inhabitants of Liverpool, and nine million gallons per day to the mill-owners and others whose interests were affected by the works. After being stored, the water was passed through a cast-iron main-pipe of 44 inches diameter, and twenty-three miles in length. Great difficulties were encountered in constructing the works, in consequence of the variable character of the ground, upon which the main embankments and other retaining works had to be constructed. It was deemed necessary, in several instances, to excavate the puddle trenches to depths of 50, 60, and even 70 feet below the surface of the ground. The cost of the works, land, Parliamentary and local inquiries, had reached about 750,000*l.*; but of this sum it was estimated that 150,000*l.* had been expended upon, and in consequence of, the contentions of the local authorities. In addition to this outlay, the purchase and improvement of the works of the two Companies by which Liverpool was formerly supplied with water, had amounted to about 850,000*l.* Hence the total cost, to the present time, of providing water for the inhabitants of Liverpool and its neighbourhood, numbering altogether about 500,000 persons, was upwards of one and a half million sterling, or somewhat more than 3*l.* per head. The two works together were, however, capable of supplying twenty gallons per head per diem to one million of people.

The statement of the receipts and expenditure showed that there was a balance of upwards of 700*l.* in the hands of the treasurer.

After the reading of the report, Telford Medals were presented to Messrs. D. K. Clark; R. Hunt, F.R.S.; G. Rennie, F.R.S; and W. B. Adams; and Council Premiums of Books to F. R. Window; G. B. Bruce; A. S. Lukin; C. E. Conder: W. Bell: F. R. Conder, and T. Dunn.

The following gentlemen were elected to fill the several offices on the Council for the ensuing year:—Joseph Locke, M.P. President; G. P. Bidder, I. K. Brunel, J. Hawkshaw, and J. R. McClean, Vice-Presidents; W. G. Armstrong, J. Cubitt, J. E. Errington, J. Fowler, C. H. Gregory, T. E. Harrison, T. Hawksley, G. W. Hemans, J. S. Russell, and J. Whitworth, Members; and S. Wood and M. D. Wyatt, Associates.

ANCIENT BRICKS.

As a *pendant* to the article on ancient and modern bricks in last week's number, perhaps a few particulars, which I have gathered from the account of Lord Macartney's embassy to China, regarding that stupendous piece of brickwork, *the wall*, might have some interest.

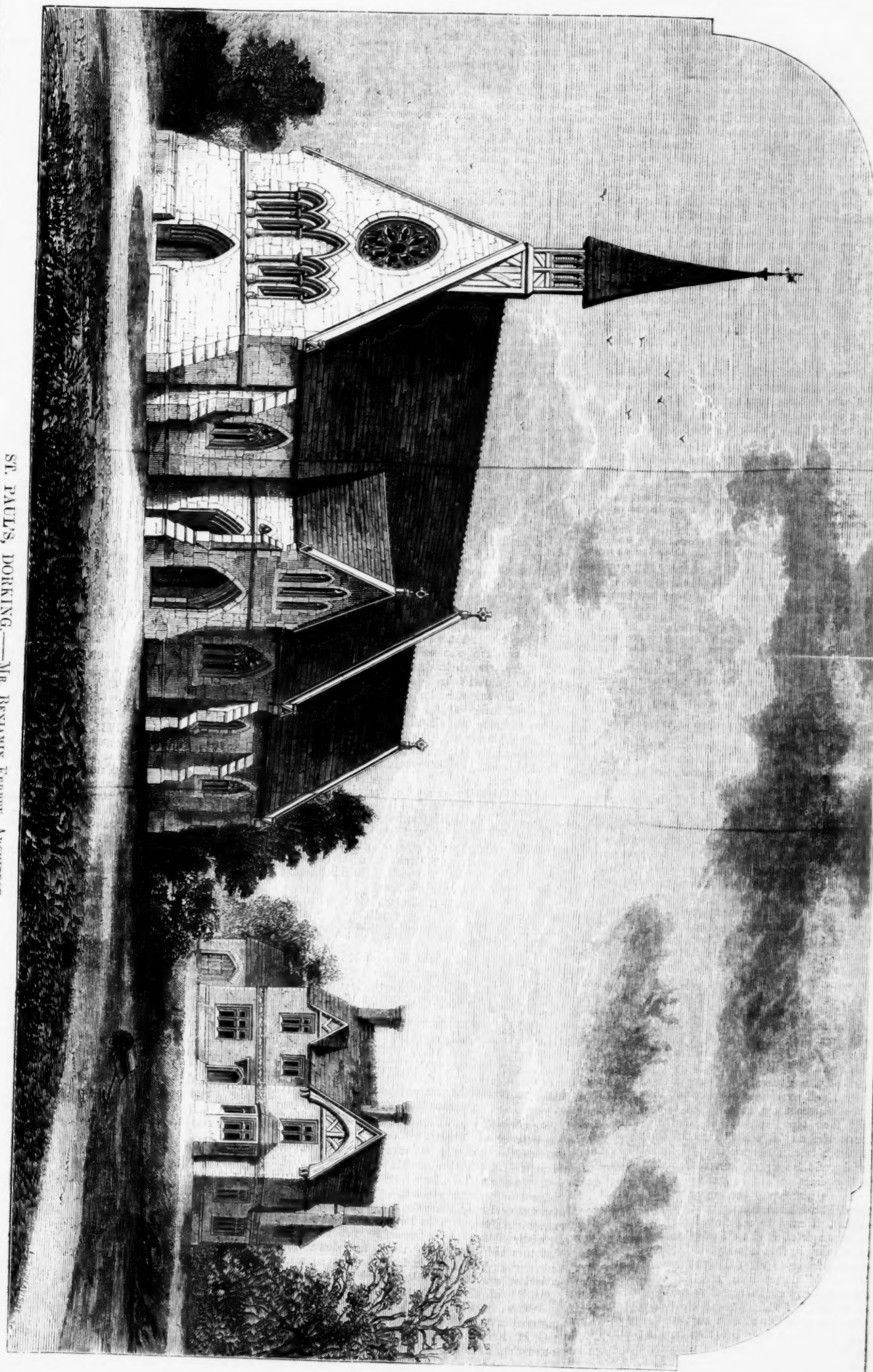
The dimensions of the bricks seem to vary (according to their use); those in the front of the walls being 15 inches by $7\frac{1}{2}$ inches by $3\frac{3}{4}$ inches, and those for paving, 15 inches square. The bricks are fire-burnt, and of a bluish colour. The faces of the wall (which batter) are finished with *moulded*, not cut, bricks. The quoins of windows, doors, embrasures, and salient angles "in" the towers, are of strong grey granite, containing but little mica. The joints of mortar are about half an inch thick.

London brickwork, with its niches, festoons, pilasters, consoles, cornices, architraves, its panellings, and its unique window-heads, such as at No. 5, Bow-churchyard, is a study in itself. S. C. R.

ST. PAUL'S CHURCH, DORKING.

The church and parsonage, represented in our engraving, stand on a sloping piece of ground, in the outskirts of the town of Dorking, near the Deepdene, the residence of Henry Thomas Hope, esq. by whom the site was given. The church is built of Bath stone and flint: the roofs are covered with tiles. In style it is Early Decorated, or Geometrical. The interior is fitted up with open stained deal seats, accommodating between 500 and 600 people. There is a small western gallery, forming part of the solid construction of the building, supported on stone arcading. The east and west windows are filled with painted glass, by Hudson. The walls of the interior are ornamented by ecclesiastical devices, in stamped stucco. The west gable terminates in a bold oak shingled bell-cot. The church and fences cost about 2,700*l.* The parsonage adjoining is of new brick and stone dressings, and cost 1,500*l.* The church and parsonage are built at the sole expense of John Labouchere, esq. of Broomehall, who has also liberally endowed the church. Mr. Ferrey, of London, was the architect. The contractors were Messrs. Shearburn and Son, of Dorking. The church was consecrated on the 15th of July last.

Reading-room at a Manufactory.—The workmen at Messrs. Maudslay, Sons, and Field's, engineers, Lambeth, have voted an address to their employers for placing at their disposal a comfortable reading-room and mess-room.



ST. PAUL'S, DORKING.—MR. BENJAMIN FERREY, ARCHITECT.

THE ATTEMPTED LAUNCH OF THE "LEVIATHAN."

Sir,—It is very satisfactory to many of us who were watching and wondering, to find that your judicious and well-merited observations of Friday, the 11th, have changed the tone of the daily press. Up to that time they had believed what they were told, and taken everything for granted. They have since then, I am glad to see, exercised their own judgment more upon the matter. Mr. Yates's avowal of his contempt for the press has probably aided in opening their eyes. The doings at Poplar have been anything but useful to English reputation. The *Mechanics' Magazine*, following your lead, says,—"Was ever such a spectacle witnessed as thousands upon thousands have for weeks past beheld on the Thames!—an English engineer, at the head of multitudes of mechanics and labourers, breaking ponderous engines, rending enormous cables, crushing solid masses of timber, bursting strong iron vessels, forcing up the soil, tearing up the very bed of the river, expending vast sums of money, impoverishing shareholders, ruining the vessel herself, spreading terror around, imperilling life—keeping this up day after day, week after week, and even month after month, and all in order merely to *lower* a ship from the shore to the river!"

Much misinformation has been given to the public in grandiloquent terms: compare, for example, the description which has been circulated, probably from official sources, of the "launching ways" and the "check-tackle," with what is actually the case. Of the former it has been said,—

"The arrangements for launching her were directed by Mr. Brunel, who has planned two inclined ways from beneath her, to a distance of 300 feet down the bank of the river, on an inclination of 1 in 12. These ways are about 120 feet wide: the distance between them is also 120 feet, and the substructure, which carries the rails, and upon which the cradles are to slide, are of immense strength and solidity. Under each way are driven seven rows of piles, the four outside rows having piles at the distance of every 3 feet, while the three inner rows have them driven only every 6 feet. The piles are forced down to the gravel bed of the river, commencing under the ship's bottom, and extending to low-water mark on the bank. On each side of every row of piles, are timbers 12 inches by 12 inches square, bolted together, securing the heads of the piles between them, and extending the entire length of each way. The whole is covered with concrete, to a thickness of 2 feet; and above are longitudinal timbers of great strength, running the entire length of the way. On the top of these, placed transversely are timbers of the same strength, but only 3 feet apart, and the whole is securely bolted together, forming one solid structure. Upon this are laid the metals on which the ship is to be lowered. (?) They are heavy bridge rails, similar to those used on the Great Western Railway, and are screwed down to the timber roadway."

The difference between the manner in which these ways were constructed and that described above, is very great, as the following account of them will show.

The first step in preparing for the launch was to clear away the mud and dirt to a regular inclination of 1 in 12 from the ship down to low-water mark; after which, the five rows of piles forming each way, and varying from 25 feet long near the ship, to about 6 feet near low-water mark, were driven: the two outer rows on each side of each way were pitched 3 feet apart, and at a distance of 20 feet inside them, another row; but these inside rows, three in number, were pitched 6 feet apart, so that the breadth of each way, viz. 80 feet, was divided into five stripes, of 20 feet wide, extending from the bottom of the ship down to low-water mark. To the sides of these piles, just below their tops, balks of timber, called waling-pieces, each about 12 inches square, were bolted, *on the outside of each row only*, by 1½-inch iron bolts, and the surface of the mud over the area of 80 feet wide, was then covered with a layer of concrete, barely 1 *foot thick*, upon which other balks were laid, about 2 feet apart, and in lines parallel to the rows of piles; these balks were also about 1 foot square, and concrete was then put into the empty space between them, and levelled to an even surface with their tops; so that instead of the ways being constructed on "2 feet of concrete," the whole superstructure is carried upon only "1 foot" of this material, and the support derived from the bolts in the waling-pieces against the heads of the piles.

As an instance of the amount of calculation and foresight exhibited throughout this famous launching exploit, it may be mentioned that when the ways were completed it was "found" that they were *not wide enough*; that is to say, that they were not sufficiently strong to carry the great weight about to be "lowered" down them, and the consequence was *that each way was increased in width by an addition of* 40 *feet!!!* which was done by driving a row of piles on each side of each way, at a distance of 20 feet from each outer one, thus making the rows of piles in each way seven in number, and concrete, balks, waling-pieces, &c. &c. were added, as was done in constructing the part already completed. What addition this made to the first estimate for the launch would be an interesting item; but there can be no doubt that the *total cost* will form a valuable record for the archives of the Institution of Civil Engineers, where they might be enrolled as a sort of thing to be avoided, with a salutary effect.

We now come to the "ultra scientific" "check-tackle," which is thus described:—

"The most interesting and important parts of the material connected with the launching of the *Leviathan*, are the 'check tackles.' In front of the cradles, on the shore side of the ship, and in order to regulate the too rapid descent of the vessel, and retard her progress should it become too rapid, two immense friction-drums, or capstans, have been constructed. The drum part of these machines, round which the main chains are coiled, are 18 feet long, by 8 feet in diameter, and are connected with the cradles by powerful chains 2¾ inches in thickness of link, weighing 5 cwt. to the fathom, passing round double-sheaved iron blocks in the framework of the cradles, and, with brakes, bearings, &c. weigh no less than 60 tons each. The whole has been fastened firmly by means of piles driven into the earth, so as to resist any possible strain that might be put upon them (?). They are, without doubt, the largest and most powerful of the kind ever constructed. The flanges of the barrel which carry the chain serve for the brakes: they are about 1 foot wide, and 13 feet in diameter. Round these are bands, or straps, of wrought-iron, 12 inches wide, by 1 inch thick, which can be tightened up by means of levers, 15 feet long, worked by block pulleys. The chains, after being carefully wound upon the barrel, are passed through the sheaves, the two lower ones being attached to the cradle: the end is then secured to the timber framing which carries the whole apparatus, and is constructed in the strongest possible way. Nothing has been left undone to render this part of the 'tackle' as effective as it can be made. The frames which carry all this are constructed of timber driven to a depth of many feet into the ground, and strutting against the timber framing of the ways, the whole being held together by bolts and ties. In these framings are also placed the hydraulic presses which start the vessel. The necessity and efficiency of the 'check tackle' in controlling the descent of the vessel was fully proved at the first attempt to launch."

We find from the above that the "check tackle" and machinery were found to work admirably, and showed how completely the movements of the monster could be controlled, and that their necessity and efficiency in controlling the descent of the ship, were fully proved at the first attempt to launch. This, no doubt, reads well, and looks remarkably grand; but so far from their efficiency having been proved, or their having in any way been shown to be of the slightest utility in checking the ship, the contrary is satisfactorily proved by the fact, that when the ship stopped after her first movement, and at the moment it was reported that she was held by this "check tackle," there was, at least, *one foot of slack* between each cradle and check-drum.

Another circumstance has proved the complete uselessness of these costly appendages, viz.—that at every renewed attempt to launch, and with everything slack, and nothing to stop her but "friction," it has been found nearly impossible to start her, or keep her in motion with the overwhelming power applied to get her along.

Instead of carrying on a set of vagaries (dignified by the title of "experiments") with a couple of pieces of balk, some rails, and a few tons of iron, in order to "discover" (?) the amount of friction of metal upon metal, which, by-the-by, I remember was done some thirty years since by Morin and others, it would have been far better to have profited, in this instance at least, by the experience of others.

I should think Mr. Scott Russell must feel happy in having no share of the responsibility of this disastrous experiment in launching resting upon his shoulders.

The scientific public have already obtained an idea from your pages of the sort of secretary possessed by the company, and it is unnecessary therefore for me to say anything on that head. An Engineer.

EDUCATION AND PROFESSIONAL LIVES OF THE EARLY ITALIAN ARCHITECTS, PAINTERS, AND SCULPTORS:

AS CONTRASTED WITH THE EDUCATION AND PRACTICE OF MODERN TIMES.*

We now come to one of those masters of threefold practice, of which the history of modern art-practice has produced no example, viz.;—Andrea Orcagna—died, 1376—painter, sculptor, and architect. In the introductory lines of this life, Vasari makes the following remark:—"We seldom find a man distinguishing himself in any branch of art who cannot readily acquire the knowledge of others, more especially of those more immediately connected with that to which his attention was first devoted, and which proceed, so to speak, from the same source."

Andrea was born in Florence: his father was a goldsmith, of whom he probably learnt drawing and modelling: he then went to study sculpture, under Andrea Pisano. He then made attempts at painting, both in fresco and distemper, in which he received instruction from his brother Bernardo. He soon began to execute paintings: from the fame acquired by these he was appointed to paint in the Campo Santo at Pisa. During this time we hear of his executing certain sculptures in marble; then returning to Florence, he was employed as a painter. During this time he used to prepare designs for a brother, who was a sculptor: he then took to studying sculpture earnestly; and after this he (mark this, as in accordance with what I have said to be the secret of the success of the working of the system of the times) took also to studying architecture with the utmost diligence, "believing," says Vasari, "that he should find this also useful at some future day, as he did; for about this time the commune resolved to erect a building in which the citizens might assemble during the winter. A competition, which was a favourite method in those times, was set on foot. Orcagna's plans were found to be the best, and the building, commonly known as the Loggia de Lanzi, was immediately erected under his superintendence." Vasari mentions rather an important error in the placing of the Loggia, viz. that it faces the north, and in winter no one can remain in it for the sharpness of the wind, so that its primary purpose was frustrated. After this he returned to painting; but soon after it was resolved to erect the tabernacle in the Or San Michele; and resolving also that it should surpass all works of the kind before erected, in design, workmanship, and material, they, in accordance with the principle of selecting the greatest artist of the age, whatever may be his peculiar walk, says Vasari, "confided the charge of the whole to Orcagna, as being the most excellent artist of the age." He prepared several designs of the work, of which one was selected, after which those in authority gave up the carrying out of the work entirely to Orcagna. He then selected the first sculptors out of different countries to do the other parts of the work, reserving the figures for himself and his brother Bernardo, the painter. Thus we have a striking example of the practice of those times. Orcagna's work was equally good, whether in painting, as shown in his celebrated works in the Campo Santo; his skill in design and sculpture, as seen in the beautiful tabernacle in the Or San Michele; or his architectural design in the beautiful Loggia de Lanzi;—showing that the cultivation of the sister arts greatly assists in bringing out the powers of a man of genius in any one of them in which he may be engaged. We next come to one entirely given to sculpture, but whose works were so connected with architecture, and whose life throws so much light on the practice of the times, that I accept the plea that he was engaged with Brunelleschi in the works of Santa Maria, and include him with the architects to whom I allude.

Lorenzo Ghiberti (born 1381, died 1455, whose works I consider the models of architectural sculpture for the present day, and the casts from whose works in the Architectural Museum and at the Crystal Palace I particularly recommend to your notice as objects of special study) was born in Florence. His father-in-law was a goldsmith, and from him he acquired his art, in which he speedily surpassed his instructor; but his delight was in design and sculpture, and he soon began to employ himself in casting small figures in bronze, which he finished very gracefully; he took pleasure also in imitating ancient coins and medals, and taking portraits of his friends. After this we find him, having left the city on account of the plague, working in Rimini, after the indiscriminate manner of those times, as a painter, in conjunction with another in decorating a church. He, however, still worked at sculpture, executing relievi in wax and stucco and other materials, well knowing, says Vasari, that such relievi are the drawing exercises of sculptors, without practice in which they cannot hope to bring any great work to perfection. When the pestilence had ceased the signori and the Guild of Merchants resolved to proceed with the two doors of San Giovanni. To select a master to design and carry out these they had recourse to rather a singular mode of competition, the object kept in view being not directly to obtain the best design, but to find out the best man, in all respects; and consequently, in all probability, in the end obtain the best design also. To effect this they did not ask for the designs for the door as in an architectural competition, or for casts of the whole as in the late competition for the Wellington Monument; and, indeed, as in the sculpture competitions generally; but a large number of foreign and other artists being assembled in Florence, they began by selecting seven to compete; then selected a subject to be executed in bronze, and giving each artist a sum of money, they gave them a year to execute it in, and waited the result. When the time arrived, the seven specimens were given to the Guild of Merchants. At this time there were a large number of foreigners in the city,—some painters, some sculptors, others goldsmiths. The Syndics, setting an example that might well be followed by all competition committees at the present time, invited these artists to give judgment on

* Read at the Architectural Association, by Mr. Druce. See p. 732, *ante*.

the works. The number of these with those of the same calling in Florence who were also invited, was thirty-four, all experienced in their several arts. These reduced the number to two, Ghiberti and Brunelleschi; but the final decision forms one of the most honourable records in the history of art, and will always shed a lustre on the two eminent artists, Brunelleschi and Donatello, both competitors, more than all their celebrated works. It shall be given in Vasari's words: "When Donato and Filippo saw the care and success with which Lorenzo had completed his specimen, they drew aside together, and conferring with each other, decided that the work ought to be given to him, because it appeared that the public advantage, as well as individual benefit, would be thus best secured and promoted; since Lorenzo, being very young, for he had not completed his twentieth year, would have the opportunity, whilst exercising his talents on that magnificent work, of producing those noble fruits, of which his beautiful story gave so fair a hope. They declared that, according to their judgment, Lorenzo had executed his specimen more perfectly than any of the other artists, and that it would be a more obvious proof of envy to deprive him of it than of rectitude to accord it to him." And would that the feelings with which all men looked upon the collected works of their fellow competitors were such as influenced these great men: zeal for the public advantage, that it should be served in the best manner possible; zeal for the art, that the man should be selected likely to carry out the work with the greatest beauty and perfection; and, finally, zeal for justice, that the premium should be given for the best work. If such were the feelings of competition committees, would there be any partiality or giving the work to relations or fellow-townsfolk? For the considerations would be, will this design carry out most efficiently the purposes and intention of those who pay for it, and for whose use it is intended?—will this design further the art more than the others?—is it the most beautiful and complete, and will it reflect the most credit and fame on the architect employed, and the city or community for whom it is built? Then, if these facts are granted, it becomes no longer a matter of choice, but an obligation and matter of necessity, that this one and no other should be selected, or, to use Brunelleschi's words, "it becomes a more obvious proof of envy to deprive the artist of the charge and reward of carrying it out than of rectitude to accord it to him."

This is the only code I would have binding on committees or competitors. When Lorenzo had completed this work, the Guild of Merchants gave him one of the statues on the Or San Michele, viz. of S. John the Baptist, but I shall not follow his works. Of his second door we have a cast in the Crystal Palace: he was continually employed in sculpture, but even he showed some of that versatility which seems to be a marked characteristic of the elder masters. We find he prepared a model in wood for the church of San Lorenzo, and that he gave his attention to various branches of art, and took delight in painting and working on glass: he made the windows round the cupola of Sta. Maria, and the three windows above the principal door; and, as I have previously mentioned, he was associated with Brunelleschi, his former competitor, in superintendence of that church. This, however, was an act of injustice, as Brunelleschi was the sole inventor of the way in which the work was to be carried out, and, therefore, alone capable of conducting it, while Ghiberti had never thought of it till appointed his colleague. He died at the age of sixty-four.

We have next to consider the education and practice of a great constructive architect, viz. Filipo Brunelleschi,—born, 1377; died, 1446. We all know his great work, his great inventive skill, his great constructive qualities, but I think most people would imagine his early education to have been other than what it was. Let us see. His father wished him to be a notary, but seeing that his mind was constantly bent on various ingenious questions of art and mechanics, he made him learn writing and arithmetic, and then placed him in the Guild of Goldsmiths, that he might learn the art of design of a friend of his. See how important this was thought in those times! No man was expected to rise in any branch of art or constructive science that had not been previously grounded not merely in the art of drawing, but modelling, or some special useful practical branch, such as sculpture or painting. He soon showed so much skill in setting precious stones, and in designing and executing figures in silver, that his first work was executing two figures of prophets, for the altar of San Jacopo di Pistojia. He seems, however, always to have had a considerable mechanical turn in his mind, as we find his attention occupied by the computation of the divisions of time, adjustment of weights, and movement of wheels; making several watches with his own hand. He was then seized with an earnest desire to attempt the art of sculpture, which led to his intimacy with Donatello: he then, says Vasari "gave his attention to many professions; nor had any long time elapsed before he was considered by many good judges to be an excellent architect. At that time a statue of Linden Wood was required for the monks of San Spirito. Brunelleschi, being desirous to prove that he could execute large works as well as small, undertook this. He then gave considerable attention to the study of perspective, the rules of which he much improved. We next find his active mind busy studying the Scriptures, and the works of Dante. At this time it was that finding fault with a crucifix of Donatello's, he received the answer of "Take wood, then, and make one thyself;" which he did, and Donatello confessed himself beaten by the one produced, which is now on the altar of the chapel of the Gondi. We next come to the competition for the doors of San Giovanni, he also at this time made a design for the marble pulpit in the church of Sta. Maria Novello. But the study of architecture was now becoming predominant with him, and, selling a farm which he possessed, he set out with Donatello to study at Rome. And now we begin to find the influence of the change from Gothic to Classic, from picturesqueness to measured proportions, from artistic design to mechanical imitation. "For," says Vasari, "they instantly made preparations for measuring the cornices, and taking the ground plans of these edifices, Donatello and himself labouring continually, and sparing neither time nor cost: no place was left unvisited by them either in Rome, or without the city, or in the Campagna; nor did they fail to take the dimensions of anything good within their reach." Again he says, "Filipo had two very great purposes on his mind, the one to restore to light the good manner of architecture, which if he could effect, he should leave no less a memorial of himself than Cimabue and Giotto had done; the other was to discover a method for constructing the cupola of Sta. Maria del Fiori, in Florence, the difficulties of which were so great, that after the death of Arnulpho Lapi, no one had ever been found of sufficient courage to attempt the vaulting of that cupola, without an enormous expense of scaffolding. He did not impart his purpose either to Donato, or any living soul, but he never rested while in Rome, until he had well pondered on all the difficulties involved in vaulting the Pantheon, and had maturely considered the means by which it might be affected." We have also from Vasari an instance of the value of possessing a handicraft in the midst of his studies, we find, like many an artist-traveller in the present day, "that the money of Filipo falling short, he supplied the want by setting precious stones for goldsmiths who were his friends." And now came the occasion for which Brunelleschi had so diligently prepared himself. An assembly of architects and engineers was gathered in Florence by the superintendents of the works of Santa Maria del Fiori, to consult on the best means of raising the dome. I have not time to enter into the difficulties, the discouragement, the ridicule of his scheme as impracticable, and other obstacles that Brunelleschi met with before he could bring the authorities to entrust him with the work that he had so long set his mind on. We all know the result, and the details you can read for yourselves: sufficient has been quoted to show the character of the man and the practice of the times. One more anecdote I will, however, give, to show that his love of art was as great as his mechanical skill. Donatello having described an antique vase at Cortona, "he became," says Vasari, "inflamed with such an ardent desire to see it, that, impelled by the force of his love of art, he set off as he was, in his mantle, his hood, and his wooden shoes, without saying where he was going, and went on foot to Cortona for that purpose. Having seen the vase, and being pleased with it, he drew a copy of it with his pen, and returned therewith to Florence before Donato or any other person had perceived that he had departed—all believing that he must be occupied in drawing or inventing something. Having got back to Florence, Filipo showed the drawing of the vase, which he had executed with much patience, to Donato, who was not a little astonished at this evidence of the love that Filipo bore to art." To show his great zeal and activity in his long-cherished work, I will quote the following out of a lengthened description. "Perceiving the building to proceed rapidly, and finding all his undertakings happily successful, the zeal and confidence of Filipo increased, and he laboured perpetually: he went himself to all the ovens where the bricks were made, examined the clay, proved the quality of the working, and when they were baked he would select and set them apart with his own hands. In like manner, while the stones were under the hands of the stonecutters. He would look narrowly to see that they were hard and free from clefts; he supplied the stonecutters with models in wood and wax, or cut hastily on the spot from turnips, to direct them in the shaping and juncture of the different masses. He did the same thing for the men who prepared the ironwork. During the time that this building was in progress he made models with his own hand for many works. He died at the age of sixty-nine, and was buried in Santa Maria del Fiori.

Let us pass on to his friend Donatello, born 1386; died 1468; who, though he studied architecture with him in Rome, still continued to practise principally as a sculptor.

Vasari says "that he devoted himself to the arts of design, and was not only an excellent sculptor and admirable statuary, but was besides very skilful in works of stucco, well versed in the study of perspective, and highly esteemed as an architect. Like those of Ghiberti, his works, as shown in the few casts in the Crystal Palace, and also in his works I have seen at Florence, appear to me to be especially valuable as models of modern architectural sculpture, and, belonging to a transitional period, they are precisely of that type of perfect sculpture which harmonizes with Gothic architecture, and yet equally with Italian; and I would specially recommend the casts in the Crystal Palace to the notice and study of young architects and architectural sculptors. Nothing is specially known of his education, nor is there anything particularly worthy of note in his practice, except his extraordinary and unceasing industry. The number of his works is extraordinary. The St. George, at the Or San Michele, is one of his most beautiful works, a cast of which is in the Crystal Palace.

Alberti was an architect alone, and known chiefly by his writings. He was fairly skilled in painting, though he did not practise it, and wrote on that art also. Both his education and practice show signs of transition to the present mode of education and practice. Vasari says, "he gave his attention not only to the acquirement of knowledge in the world of art generally, and examinations of works of antiquity in their proportions, &c. but also, and much more fully, to writing on these subjects, to which he was by nature ordained, rather than to the practice of art."

That is to say, like many of the present day his knowledge of art was more that of the scholar and antiquary than of the practical executant, such as the sculptor or painter, and even the architect conversant with these arts; and, according to Vasari, his practice showed his want of this sort of knowledge, for we find the following passage:—"Leon Batista would not have fallen into this error if to the knowledge he possessed and to his theories he had added the practice and experience acquired by actual working: another would have taken pains to avoid this difficulty, and sought rather to secure grace and beauty to his edifice."

That is, that when a man is taught the theory of architecture alone, and the manner in which those of bygone times worked, and to this adds learning, knowledge of construction, and mathematical skill, his work is apt to be more scholarly than artistic, as in this instance to which Vasari alludes, viz. the apse of the Nunziata in Florence, in which Alberti thought more of the different intricacies of the plan and the correctness of the proportions, according to the antique than to the beauty and happiness of the effect of his building.

Bramante, painter and architect, &c. began his education by studying the works of Fra Bartolomeo, but being more inclined to the study of architecture, he moved from Urbino to Milan, for the purpose of examining the Duomo. His first work in Rome was to paint the arms of the Pope in fresco over the door of San Giovanni Laterano: he then studied the antiquities, making accurate measurements, and in no long time had examined and measured all the buildings of antiquity in Rome and in the Campagna, also in Naples, and wherever ancient buildings were to be found. He thus attracted the notice of the Cardinal of Naples, who appointed him to rebuild a cloister in Travertine: he was thus introduced to the Pope, and finally prepared the first deisgn for St. Peter's. We see that by this time the mode of education and practice had much altered, and that, though we find this architect brought up as a painter, yet his subsequent education did not differ much from that considered necessary a few years ago. The change that was fast coming over the practice of architecture is seen in the education of Antonio San Gallo, who, brought up as a carpenter, studied architecture under his uncle, an architect, and afterwards became assistant to Bramante, who used to give him sketches and descriptions of buildings, which he left him to carry out. He succeeded his master in the works of St. Peter's.

Raffaelle, painter, architect, and sculptor. We find that the more exalted geniuses, even at this time, adhered to the practice of the earlier masters; and whether their chief art was painting, as in the case of Raffaelle; or sculpture, as in the case of Michelangelo; they more or less practised the other two arts, as opportunities occurred. Raffaelle was educated first by his father, whom he at a very early age assisted in his works; and then by Perugino, who was himself a pupil of Andrea Verochio. His first archi-

tectural works were designs for the ornaments in stucco for the Loggia. He also gave designs for a villa for the Pope, and a palace for the Bishop of Troia, in the Via di San Gallo, in Florence: he gave a design for the stables of the Chigi Palace, and for the chapel of that family in the church of Sta. Maria del Popolo: he was employed to superintend the works of St. Peter's; and was much interested in the clearing and discovery of the antique remains of Rome, in measures for the restoration of which he was much occupied at the time of his death. His pupil also,—

Giulio Romano, being his favourite pupil and assistant, though first educated by him as a painter, followed his master's mode of practice; for Vasari says, "Proceeding thus in the service of Raffaelle, his master, and acquiring a knowledge of the most intricate difficulties of his art, which were taught to him by Raffaelle with the utmost affection and solicitude [to how few masters can these terms be applied], Giulio soon became to be able to draw perfectly in perspective, to measure edifices, and take plans of buildings: Raffaelle frequently designing and sketching certain inventions after his own fashion, which he would then leave to Giulio, to the end that the latter might complete them on an enlarged scale, and with the exact measurement and proportions, so that they could afterwards be used by his master in his architectural undertakings. In these last-mentioned labours more particularly, Giulio Romano soon began to take a great delight, and devoted his attention thereto in such sort that, when at a later period he exercised the vocation of an architect, he proved himself to be a very excellent master." Raffaelle's mode of practice in giving rapid sketches of his designs was rather different to that of Giotto, who prepared models, even to the details and sculpture, with his own hand. Yet both were painters: Raffaelle, indeed, executed more works in architecture than Giotto. What made their practice so different? In the first place, the old Gothic habit of extreme care was fast disappearing; and, in the second, the imitation of the antique, and the prevalence of measured proportions, rendered the completion of the master's first ideas by another hand more easy, when they were peculiar arrangements of known proportions, than when they were burning thoughts from the mind of the master, so connected and influencing the whole structure, that another hand could not complete them.

The practice of Giulio Romano was peculiar, as he designed many buildings, and decorated them with frescoes by the hands of himself and his disciples, as we may gather from the following quotation:—"This artist produced so many designs, both in Mantua and other places, that their amount appears incredible; but as we have said, there could be no palace or other building of importance erected, more especially within the city of Mantua, unless it were constructed after a design by him. He rebuilt the church of San Benedetto, in Mantua, a very large and rich edifice, belonging to the Black Friars, and situated on the old walls, near the river Po: after his designs, also, was the whole church embellished, and adorned with beautiful pictures and fine paintings in fresco." We also find that designs for "tapestry and cloth of arms" were made by him: indeed, he would never, says Vasari, refuse to set his hand to the most trifling matter, an example which, if followed by artists at the present time, would cause our common-place and every-day things of life to be much better designed than at present.

His master was earnestly solicited to return to Rome, and undertake the works at St. Peter's; but while the negotiation was pending he died. As an illustration of the different works then given to the charge of the architectural artists of those days, you will, perhaps, pardon the following quotation:—

"When the Emperor Charles V. arrived at Mantua, Giulio made many magnificent preparations for his reception, by order of the duke: these consisted of arches, perspective scenes for dramatic representations, and various matters of similar kind; for never was there any man, who, in the arrangements of masquerades, or the preparation of extraordinary habiliments for jousts, festivals, and tournaments, displayed fancy and variety of resource such as he possessed: this was acknowledged with astonishment and admiration at the time by the Emperor Charles, and by as many other persons as were present."

San Micheli, the great architect, but greater military engineer, acquired the first principles of architecture under his father and uncle. There is a difference in the words used by Vasari in speaking of these later masters: in these it is "acquired the first principle of architecture:" in the lives of the earlier ones, it is "acquired the first principles of art;" a very good distinction, as the later masters principally studied the antique buildings, to learn the principles upon which they were erected and ornamented, with a view to produce similar buildings, and combined this knowledge with the science of construction or building; while the others not only learnt the principles, but the practice of all the decorative arts, and then learning the science of building became practical producers of original buildings, never satisfied unless some new and original thoughts distinguished their buildings from all that preceded them. But to return to San Micheli: he completed his education by visiting Rome, for the purpose of studying and measuring the antiquities.

Michelangelo Buonarroti, sculptor, painter, and architect. I have said that all the men of extraordinary genius, even in the later times, adopted the custom of a three-fold practice: thus we find that Michelangelo, placed with a master to learn painting, was induced to study sculpture by his admiration of the antique statues in the garden of Lorenzo de Medici; and after long practice in these arts, he erected the sacristy and new library of San Lorenzo, at Florence; that he was also much employed in rebuilding and strengthening the fortifications of that city; and that finally he was invited to undertake the superintendence and sole direction of the works at St. Peter's. He was, however, loth to undertake so great a work, saying, "that architecture was not his vocation;" but being commanded to do so by the Pope, he prepared the model. (I suppose his reluctance arose from the labour of so large a work at so advanced an age, being over seventy at the time, and also from its leaving him so little time for his other vocations). "At length," says Vasari, "the Pontiff issued an edict, by which he appointed him superintendent of the fabric, with full authority to do and undo, decrease, extend, or change, as it should seem good to him; and furthermore commanding that the whole government of those who were employed under him should be in his hands thereupon; Michelangelo seeing the confidence which the Pope placed in him, desired to prove himself worthy, and had a clause inserted to the effect that he performed his office for the love of God, and would accept no reward;" though, according to Vasari, his means were very limited. What a glorious end for a great man—what a beautiful finish to his extraordinary and active life! At seventy-four we find the veteran artist giving all the skill, art, and experience derived from a long life of three-fold practice, to erecting a church wholly to the glory of God. During the last fifteen years of his life, he erected many works in Rome. And now we come to one of the last of the artist architects.

Sansovino, in whose works there is an artistic spirit which, when I was abroad, delighted me more than any other work of the same period, was brought up as a sculptor and an architect. It is worthy of note, in passing, how many great men were brought to light, or obtained honour, by working at the statues and other decorations of the Or San Michele. Sansovino attracted notice by a model that he prepared for one of the statues, as, though another obtained the commission, as the elder master, Sansovino's was the most beautiful, in consequence of which he was taken to Rome by Giuliano San Gallo, architect of Pope Julius II. Now, when Jacopo came to Rome, what charmed him most; and what did he earnestly set himself to do? To measure all the antique buildings? No! Vasari says, "when," that is to say, when he had been brought to Rome, "the statues of the Belvidere attracting him beyond measure, he set himself to copy the same. Now Bramante, who was also architect to Pope Julius, holding the first place, and having rooms in the Belvidere, chanced to see the designs of Jacopo, with a nude figure of clay in a recumbent attitude, holding a vase for ink, which he had also made, and these things pleased him so much that he began to favour the youth, and ordered him to make a large copy in wax of a certain subject, which he was also having copied by other artists, intending to cast it in bronze. When all had completed their work, Bramante showed the models to Raffaelle Sanzio, inquiring of him which he thought the best. It was then judged by Raffaelle that Sansovino had greatly surpassed the others, wherefore, by the advice of Domenico, Cardinal Grimani, Bramante was commanded to have the model of Jacopo cast in bronze." After several works in sculpture, he made designs for several triumphal arches to celebrate the arrival of Leo X. at Florence; and, in company with Andrea del Sarto, he was employed to decorate temporarily the unfinished façade of Santa Maria, after which he was almost constantly employed in architecture. * *

We have now considered how the architects of some of the principal and most admired buildings in Italy were educated, what sort of men they were, what they considered necessary to the perfection of their art, and what different occupations they considered compatible with the study and practice of architecture. We find that the architect of Santa Maria del Fiori was educated by a sculptor, and learnt drawing and design under a painter; that the architect of St. Antonio, at Padua, was a sculptor; of the Santo Campo, a sculptor; also that the Giotto campanile was the work of a painter, at the end of a long life devoted to painting; that it was carried on to completion under the superintendence of a painter; that the same hand that covered the walls of the Santo Campo, at Pisa, with frescoes, designed and superintended the erection of the Loggia de Lanzi, and designed the beautiful tabernacle in the Or San Michele, even to a new method of fitting and joining the stones; while at the same time he executed the chief and most beautiful of its sculptured ornaments. That the same man who defeated the far-famed Donatello in his own art, and was second in the celebrated competition for the doors of the San Giovanni, conceived and executed the boldest thought of constructive skill that the history of architecture can show; while the first architect of St. Peter's was educated as a painter; the second was the greatest painter that the world had produced; and the final director of the works, and author of most of the present building, was equally a king among painters and sculptors. Thus we see wherein is the difference between the education and practice of those days and that of our own times. It seems to me to be in the simple difference of opinion as to what amount of knowledge of the sister arts is requisite to make a good architect. Now, I will put it to you: you have both systems before you; you see how our present one has gradually arisen, from the observance of filed rules and measured proportions in the study of the revived Classic architecture. The results of which of the two do you prefer? Is there not in the present time, and has there not been for ages, a greater lack of originality than formerly? Are not any two buildings in the same styles you can point out more alike and less stamped with the individual mind and genius of their respective authors? Then, again, do not the merits of many of our buildings rest more upon their display of antiquarian research and archæological knowledge, than upon the grace and beauty of their proportions dependent upon the long and carefully-trained eye of the artist, or than upon the beauty and richness of their sculpture, which only masters in the art could produce, and only the same hand that planned the building could design and arrange with harmony? It is true that there is a greater movement in that direction at the present time; but to whom are we principally indebted for that? Is it not to those young architects who at the time they belonged to our class of design, showed a greater power of artistic drawing and colouring than had been seen for many a long year in the profession? But the improvement is as yet with the few. The many are divided into the designers—shall we call them rather the arrangers—according to the precedent and old models in both Gothic and Classic styles, and those who, for the sake of apparent originality, sacrifice good taste. Now what remedy for this state of things do the lives of these great men suggest? To see this, let us begin at the starting-point of a modern architectural career, and see what practical additions and antidotes the consideration of their education and practice would suggest to the present usual mode. The young architect comes from school,—a fair amount of school knowledge, and probably (or else he would not have chosen the profession) with a small amount of skill in copying drawings, into an office where everybody is busy, and nobody has much time to attend to him. Well, what is he first set to do? According to the office he enters, he may either be set to copy "Pugin's Examples," or "Chambers's," or other measured representations of old works of different periods. Now this is useful in two ways, if properly taken advantage of. It teaches geometrical drawing, and, at the same time gives them a knowledge of the buildings of old time, and is only hurtful if it gives him an idea that he will have attained the height of architectural excellence, if he can in after-life reproduce these buildings, or even buildings adapted to his purpose. With these details let him, therefore, work at these with all his might: if he is to copy them, let him copy them with all his might. Many of us, I doubt not, now regret we wasted time which would have perfected our power of geometrical drawing, exercised our mind in correctness and precision, and given us an intimate knowledge of those valuable examples of ancient art, which never can be lost time as long as we keep in their real use. But while at work at them, we should always remember that it is the general principles of taste and design involved in the production of these works—not their actual proportions or details—that ought to be useful to us in after-life. For instance, that in the Norman and Byzantine styles, it is the simplicity and massiveness of their piers and arches contrasted with the richness of appearance and varied forms of the carved ornaments that is so kept in mind—not whether the arch is round or the moulding fretted; that in the Early Gothic, grace of general proportion of the arches and piers—not the exact form of the mouldings; and that the lesson to be learnt while drawing the carved foliage in the Early Decorated capitals in

Pugin's or Collings's Gothic ornaments is the use of natural foliage when designing capitals for yourselves. From the Greeks you can derive the general principles of purity, of vast and perfect sculpture, and from the Romans the general principles of richness of ornament and profusion of sculpture; but I would advise the young student as speedily as possible to make himself useful in the actual practice of the office, for that after all is the legitimate teaching of the office, and that which at the present time it is principally capable of imparting, and in this let him imitate the masters whose lives I have brought before your notice, for we see that they speedily learnt all that their masters could teach them, and soon raised themselves from pupils to disciples or assistants. But I have said that the practice of the office is all that can be learnt in it, as if there was still something more to be learned. It is because we must remember that while we are copying engravings of ancient buildings, while we are making drawings from the direction, or from original drawings of our masters, we are not exercising our imagination and invention, taste, or faculty of choice.

Then what is to be done? Let us consider what the men did whose lives we have been considering, and we find that, although they, like ourselves, were placed with masters to learn the different arts with which they began their professional lives, they were after all principally self-taught. I would, therefore, advise those who are still in an office to exercise in the evening those faculties that have not been used during the day with some different art or occupation: for instance, while they are at their elementary work during the day of learning geometrical drawings, to exercise themselves in the evening with the freehand drawing from leaves and other natural objects, and from casts, as in the Architectural M——, which I particularly recommend to their notice. While engaged during the day at copying such works as Pugin's or Collings's Gothic ornaments, let them get some clay or a piece of Caen stone, and try to produce, in full size capitals and other ornaments (having natural leaves by them), similar to those which they have been drawing during the day, and this for at least an hour each evening previous to beginning the study of the necessary books on construction and other subjects, without which they can make no progress. While copying at the office any of the outline engravings of Greek sculpture, they should try in the evening, while studying books on the proportion of the human figure, what sort of a figure they can produce in clay of the like proportions of their day copies. When they have got into the regular work of the office, they should vary their evening's exercises by availing themselves of the power of modelling they will by this time have acquired in making models of buildings that they are engaged in at the time in the office, practising the perspective they have learnt in copying them, and studying them in different positions. Then in visiting the buildings of their masters in town or the neighbourhood, they would do well to watch carefully the carvers at their work, and in the evening endeavour to surpass them in design and execution, and to note the construction of arches, roofs, floors, church-seats, and other points of construction and ornament, while in the course of construction, and while their mode of joining and other particulars can be seen; when at home, endeavour to make models of them in wood and other materials, and also plans, drawings, and models of designs of their own. In the vacation and other leisure time in the summer, they should fill their sketch-book with the works of nature, rather than the works of man. They should seek to know all the leaves of the forest, and all the curves of the trees; the foliage of the ferns on the rocks, and the forms of the birds on the branches; and upon their return home, let them endeavour to reproduce them in their clay or stone. Let them learn outline from the mountain, and colour from the heaths and the mosses; and they will, to a considerable extent, have supplied by the evening and vacation study the deficiencies of an office education; and I am sure that their first building will show that much has been effected. And let me also point out that they will have qualified themselves for profitable employment in designing for manufactures, and also the smaller objects of architectural design, such as monuments, memorial crosses, and many other works, while they are yet deemed too young and inexperienced to be entrusted with the erection of large buildings. Perhaps the elder members and those who are no longer pupils, will allow me to remind them that the masters in question were always learning. If they consider that any of the acquirements thought necessary of old would be useful to them, I should advise them to begin at once, and that it would be in accordance with their principles if we each of us took stock of our qualifications for the art we are practising, to hope to practise; and let him who is accomplished in design and the art representation, but deficient in practical knowledge, not be the least ashamed of beginning that study at its very beginning, while those that on the contrary are well skilled in construction, but as it is often the case, deficient in design, begin at once to exercise their imagination, and improve their hand in drawing. We all of us have our weak points: let us, that the art of our age may be of the best, each of us begin to fortify our weak places, and supply our deficiencies. And there is one branch of our art that we have all neglected, viz. the study of sculpture and use of models, for the remedy of which I will conclude by proposing that, in our new quarters at Conduit-street, two new classes be formed on the principle of our present class of design, viz.,—an architectural sculpture class, or class of design in the "Round," and a class of constructive modelling; also that steps should be taken for establishing in the rooms, and in connection with the Architectural Exhibition, an annual exhibition of architectural sculpture. As in the well-known, and I hope much-loved, words of the poet;—

"Lives of great men all remind us,
We can make our lives sublime;
And, departing, leave behind us
Foot-prints in the sands of time;—

Let us then be up and doing,
With a heart for any fate;
Still achieving, still pursuing,
Learn to labour, and to wait."

CHURCH-BUILDING NEWS.

Wells, Somerset.—St. Thomas's church, which has been erected to the memory of the late Dr. Richard Jenkyns, Master of Balliol and Dean of Wells, at the cost of his widow, who died also in June last, is just completed, and was consecrated on the 21st inst. by Lord Auckland, the diocesan. The plan is a parallelogram, the east end terminating in a five-sided apse, a north aisle, gabled, and a north-western tower and spire. The easternmost bay within the apse is appropriated to the chancel and sanctuary, with a breast-wall of stone dividing it. There is a south transept for the children of the schools. The materials employed are the local stones, being cream-coloured, brown, and grey, which are alternated in the walling, and all the freestone work is of Doulton stone. The interior of the walls is ashlared with Doulton stone, having all the arches alternated with Hare-hill stone, and the shafts of the arcading are of blue lias. The exterior presents an Early Decorated church, with its nave and gabled north aisle, north porch, and lich-gate; a tower, with its enamelled clock-face beneath a canopy, and its high belfry windows, treated after the manner of the Western churches, surmounted with an octangular spire, gabled on the cardinals, and pinnacled at the angles, all richly carved and decorated. On a lower stage the buttresses are terminated with sculptures of the Evangelists. The apsidal end is parapeted in tabernacle work, and the roof rising therefrom terminates with a metal cross. The interior has its five apsidal windows occupied by stained glass, by Wailes, presented by the members of Balliol College, the subject being five types and anti-types; and the next window westward, on the south side, is by Clayton. All the others are glazed with a floriated glass of colour, by Wilmshurst. The reredos is constructed of stone and Devonshire marble, enriched with mosaics, and the empanelling is executed in gold and colour by Fisher. The pulpit is of stone and marble, and also the font, both by Forsyth. Parts are enriched with gold, and the pulpit has a book-tray of wrought brass. All the fittings are of oak. Mr. Teulon was the architect; and Mr. Davies, of Langport, the builder.

Broxbourne.—The interior of Broxbourne church has now been restored, as well as the exterior. The chancel, North chapel, and South chapel, or aisle, have been restored at the expense of Mr. G. J. Bosanquet and Mrs. O'Brien. The cost of restoring the nave and aisles has been defrayed by means of a rate, subscription, and grant. The works have been carried out from the plans of Mr. Clarke, the diocesan architect. All the seats are low and open. The chancel and aisles are arranged stall-wise, with carved poppy-heads, and traceried and panelled fronts. The east wall is diapered and painted, the first bay being enclosed with screens. All the woodwork is stained and varnished. The whole of the stonework with the plastering has been restored and renewed. The work has been performed by Mr. Ringham, of Ipswich, and Mr. Pulham, of Broxbourne. Two new painted windows, by Powell, have been placed in the Saye chapel by Mrs. O'Brien; and it is intended to raise a subscription to fill the west window in the tower, by Lavers. A memorial window, by Willement, has also been placed in the north aisle.

Blackpool.—The exterior of the new Roman Catholic church, as described by the *Preston Guardian*, is built with York flag, in narrow courses, hammer-dressed and tuck-pointed, with Minera stone dressings. The interior is worked in Minera and Longridge stone, which, from its colour, is said to give the church a sombre effect. The plan of the edifice consists of a chancel, north and south transepts, Lady Chapel, two sacristies, confessionals, nave, aisles, south porch, and central western tower. The chancel contains an east window, of five lights, which terminates in tracery; four side windows, of three lights each, with wrought and moulded shafts. The chancel is separated from the nave and transepts by a moulded arch. The Lady Chapel contains three windows, arranged to harmonize with the reredos. This chapel is said to be too small and unimportant compared with the rest of the church. The nave is divided into five bays of 15 feet each. Above each arch rise two clerestory windows, which are connected with and connect the windows with the corbels, supporting the principals of the nave roof, the legs of which run down and subdivide the clerestory wall. The aisle windows are of three lights, each of the transepts containing a large window of four lights each: a similar window also occupies the west end of the church. The western tower rises to the height of 124 feet. A spire would tend to remove the somewhat stilted effect of the angle pinnacles. Almost the whole of the windows are filled with stained glass, by Capronia, of Brussels, Barnett, and Wailes. The first is the author of the east window, which is of a later date than the rest of the building, setting at defiance all true principles of glass staining, says the *Guardian*. The side chancel windows, by Wailes, it adds, possess neither truth of drawing nor taste in colour. The clerestory windows, by the same artist, are designed with more care and judgment. The aisle windows are by Messrs. Barnett. The edifice is in the Decorated style of Pointed architecture, measures 130 feet in length, and is 54 feet broad across the transepts. The nave is 60 feet high: the chancel is 24 feet by 19 feet. The rest of the church is in proportion. It is situated in Talbot-road, Blackpool, leading directly from the railway station. Mr. Yates, of Liverpool, contracted for the entire building, which has cost, independently of the internal fittings, the sum of 5,500*l.*

Sheffield.—St. Stephen's church, Netherthorpe district, has been opened. It is situated at the junction of Fawcett-street and Bellfield-street. The edifice, according to the *Independent*, is in the Gothic style of architecture, of the geometrical period, and is in the form of a cross. A tower is placed at the intersection of the nave and the transepts, supported by four internal arches. There are no aisles, and the pews or stalls are ranged on each side of the nave and transept. There are three small galleries, one in each transept, and at the end of the nave. The pulpit, reading-desk, and chancel fittings, are in carved oak, and, along with the font, have been manufactured by Mr. Shaw, of Saddleworth. The roofs are of open timber, which, as well as the stalls and galleries, are stained oak and varnished. There is a vestry on the south side of the chancel, and also a small organ chapel opening into the chancel and transept by an arch. The whole fabric, with its organ and internal fittings, is the gift of Mr. Henry Wilson, of Sharrow, and has cost about 4,500*l.* The architect was Mr. Flockton, and the builders Messrs. Dutton and Heald.

STAINED GLASS.

Cork.—The chapel belonging to the community of Christian Brothers here has been decorated, and the whole of the windows, six in number, have been filled with stained glass. There are twelve medallions, each containing an emblem of the Passion. The ground is of ornamental quarry work, each having on it a symbolic pattern, and the whole is surrounded with coloured borders. The stained glass was executed by Messrs. Edmundson and Son, of Manchester.

Penzance.—A three-light window has just been completed by Mr. Wilmshurst, for the church of Madron, near Penzance. It contains three subjects beneath canopies,—Elijah raising the Widow's Son; the Resurrection of our Lord; and Mary speaking to Christ after the Death of Lazarus. Beneath is a brass, with inscription, showing that the window was erected to the memory of Major Robyns.

PROVINCIAL NEWS.

Bawtry.—A new infant school has been opened at Bawtry. It is a very plain and unpretending erection, and has been built at an expense of 352*l.* The architect was Mr. J. G. Weightman, of Sheffield; and the builder Mr. Howard, of Bawtry.

Loddon (Norfolk).—Tenders for new schools, at Loddon, Mr. James S. Benest, of Norwich, architect, have been received. There were seven tenders, ranging from R. Steward, of Yarmouth, 911*l.* to Griffin, of Norwich, 719*l.* The last-named was accepted.

Worcester.—The new water-works, at Pope Iron, will be opened in a week or two. They consist of engine-house, boiler-house, and cottage for engine-driver; two subsiding tanks, with strainers; three sand-filters, a pure water-tank, &c. The engine-

house, boiler-house, chimney-stack, and cottage, are brick structures, with Bath stone dressings. The subsiding tanks and filters are of hard bricks, and the walls coped with Derbyshire grit stone. From the pure water-tank the water is pumped into the main leading through the city to a reservoir on Rainbow-hill, by which the pressure will be kept up constantly during the night, and at such times as the machinery may not be in motion. From the engine-main, branch mains, extending to about 17¼ miles in length, are laid throughout the whole district. The vaulted reservoir is placed at Rainbow-hill. The contractors by whom the works have been executed are—For engine-house, filters, &c. at Pope Iron and Rainbow-hill, Messrs. Chambers and Hylton, of Birmingham; engines, boilers, pumps, and machinery, the Haigh Foundry Company, Wigan; iron pipes, Mr. Barrow, of Staveley. The hydrants and valves were supplied by Messrs. Simpson; and the pipes, &c. were laid by Mr. Aird, of London. The whole of these works were designed by Mr. Hawksley, of London, and carried out under the superintendence of his resident engineer, Mr. Purchas, Mr. Henry Lucy acting as clerk of the works.

Swansea.—The Swansea poor-law guardians have decided to build a new union for the aged and decrepit poor of the town and district, with the approbation, it is believed, of the great majority of the ratepayers; but a meeting in opposition to the scheme is announced.

Mansfield.—The unemployed here have been set to work to mend the roads, &c. the expenses to be paid from the highway rate. Between forty and fifty men have been already set to work, and thus made independent by their own labour, and kept from crowding to an overflowing workhouse.

Bakewell.—The Duke of Rutland has provided Bakewell with a partly new town-hall, in which the magistrates' meetings and county courts are now held, and which is adapted for public meetings, lectures, concerts, &c. The principal apartment is 50 feet long, 24 feet wide, and 18 feet high, to the cove of the ceiling: this room is lighted by twenty lattice windows and two skylights, the latter also acting as ventilators. The ornamented roof is partially supported by iron pillars painted to resemble Sienna marble, and the entire screens and divisions of compartments are executed in panelled wainscot, and painted like oak. The portion of the hall allotted to the use of the public is provided with seats for 300 or 400 persons.

Nottingham.—St. Matthew's schools are now approaching completion. The walls are built of Cropwell (blue) stone, from the immediate vicinity. The dressings, labels, and copings are of Ancaster stone, the whole being upon a base of patent moulded red bricks. The chimneys are of red brick, octagon on plan, with moulded caps and bases: the roofs are covered with blue and red Staffordshire tiles, in alternate bands. The buildings consist of mistress's residence, girls' and boys' schools, all with separate lobbies, entrances, and class-rooms. An entrance gateway has been erected, leading from Wollaton-street, ascending up a flight of steps to the right and left hand and meeting in the centre, at a height of 15 feet, or half the height of level. The architect is Mr. Chas. H. Edwards, and the contractor Mr. Hill, of Nottingham.

Manchester.—Adjoining the town-hall, in York-street, Cheetham, preparations have been making for an extensive building, intended exclusively for the balls and parties connected with the "Manchester Assembly Rooms" of former days, a new and select society, according to the *Courier*, having been recently organised. The building will have a frontage of nearly 100 feet, and will cover about 1,100 square yards. The rooms, which will all be on one level, will comprise a ball-room at the back, extending nearly the entire width of the building, 81 feet by 31 feet, exclusive of recesses for seats, orchestra, &c. and 40 feet high; card-room, reception-room, ante-room, refreshment-room, cloak-rooms, vestibule, &c. The chief outlay will be spent upon the interior. The front will be of brick, with stone dressings, in which some novelties of design will, it is said, be introduced. The projecting portico will be formed of pilasters and open arches filled with ornamental ironwork. A stone cornice and pediment will surmount the façade. A tower, similar to an Italian campanile, will adorn the north side, the primary object of which will be to act as a chimney and ventilator. There will be a large fan in the cellar to assist in passing fresh air into the principal rooms, and on assembly nights (says the *Courier*), it is not improbable that the luxury of scented air may be indulged in. A covered carriage-drive will be erected in front of the Assembly-rooms. Upon the ball-room will be lavished the utmost extent of decoration consistent with good taste and a chaste effect. The floor will be constructed so as to ensure a sufficient degree of springiness to the tread of the dancers. There will be an abundance of wall surface for decoration. Messrs. Mills and Murgatroyd are the architects, and Messrs. Bellhouse the contractors, who have sub-let the brickwork and excavating to Messrs. Rutherford and Lamb, and Messrs. Kelly and Evans. The work of excavation is progressing, and the hard clay, of which the ground entirely consists, will have to be dug out to a depth of 15 feet 6 inches, it being intended to have lofty and roomy kitchens, larder, supper-room, &c. below the principal suite of rooms. The bricksetters' work was at a stand for a time in consequence of the strike.

Salford.—A new clock is being placed in the tower of Trinity Church, Salford. It will have four dials, 5 feet 8 inches diameter: they will be illuminated with gas at night. The town council are defraying the expenses. Mr. Bailey, of that place, is the maker.

South Shields.—The South Shields Cemetery chapels are approaching completion, and will be ready for use by the commencement of the new year. Each chapel has a tower and spire. The upper part of each tower is an open lantern, having twelve lights, and finished with a panelled parapet; and the lower part forms the entrance porch to the chapel. The angles of the towers are surmounted by crocketted pinnacles, from which spring flying buttresses. The carving is all from natural types, comprising imitations of the maple, ivy, convolvulus, vine, lily, &c. and is well executed. The style of the buildings is Decorated Gothic. The architect is Mr. Robert Lamb, of the firm of Oliver and Lamb, Newcastle-on-Tyne.

SCRAPS FROM AMERICA.

A new church at West Philadelphia, built at the instigation of Thomas Allibone, is now about being finished. The new bank, in Chestnut-street, is also rapidly approaching completion, and its erection up to the present has cost 250,000 dollars. It is said to be a magnificent structure, to have a granite front, most elaborately ornamented; iron doors of rich design; a counter of the same material, and carved in the most costly manner; a huge vault, of chilled iron plates, erected in the centre of the banking-room, and covered with designs, displaying great artistic beauty; ceilings richly embellished in fresco, floors inlaid with marble, and everything displaying, in fact, a lavish expenditure of money for such a purpose.

In the manager's-room, which is approached by a magnificently wrought spiral staircase of iron, the decorations are said "to baffle description," and the style of the furniture and fittings displays the greatest luxury. The new bank of Nicholas Biddle, immediately opposite this, although an establishment of a much more important nature, is comparatively a plain building. It may be well to mention, as an evidence of how banking matters are sometimes managed by our Transatlantic brethren, that while this outlay was going on, the whole capital of the bank, amounting to 1,875,000 dollars, with a surplus of 400,000 dollars, had been utterly sunk, and the directors studiously kept in ignorance of the fact by the manager, the aforesaid Thomas Allibone, who has absconded, leaving the bank to close its doors, and heaping ruin on multitudes who fancied themselves in affluence.

The La Crosse railroad will be opened to Manston immediately, and shortly also to Lisbon. This road is steadily progressing, and must become one of the best thoroughfares in the north-west.

The Baptists are building a church in Portage city, and nearly all the outside work is finished. It is plain, but of appropriate character.

The works are stopped on the railway between Fond du Lac and Oshkosh. About eight miles, or half the entire distance, of the rails have been laid.

"QUANTITIES" FOR TENDERS.

Will you allow me to say a few words on the subject of quantities?

I think it cannot be denied that in all cases where contracts for work are to be let by competition, the tenders should be severally based on one certain datum. Quantities supply this.

But quantities are not to be abstracted unless an expense, in addition to the cost of preparing the drawings and specification, be incurred. The mode of charging this extra expense appears to be settled by general consent, but still there is one question which remains open, viz.,—the best mode of charging for the copies of the quantities, and which, it appears to me, it is unfair to add to the cost of the work to be done at the expense of the client of the architect. I would suggest that, in proportion to the cost of the proposed works, each builder tendering should pay a sum upon deposit on receiving the quantities, and which sum should represent the cost of preparing all the copies of the said quantities; these deposits to be returned, upon sending in tenders, to all but the successful competitor, who would thus have to bear at his own cost the expenses incurred in preparing the copies required. Architects know too well that, in many cases, builders apply for and receive bills of quantities upon which they never send in a tender; but were the course above suggested pursued, it is not too much to assume that tenders would be received from all to whom quantities were furnished; and I also believe that a healthy action would result from the adoption of such a course, which would exclude many who, while they can obtain quantities gratis, or at a charge of half-a-guinea or so, furnish tenders at prices far below cost. Such men, could they command it, would hardly care to risk a deposit for quantities; and in their place would, I expect, be substituted many respectable builders, who now stand aloof in contracts let by public tender.

Then as to errors in quantities! Would not a clause similar to the following have prevented all the recent disagreement and *exposé* at Braintree, if inserted as a condition upon which the builders receiving quantities were to frame their estimates?—

"The quantities will be assumed as correct unless the contractor, previously to sending in his tender, points out an error, should such exist. The plans and specification will be open for the inspection of the contractor at the office of the architect until ——, and no allowance will be made for any error that may be discovered after the tender is delivered."

Surely some such protective clause as this is but mere justice to the architect, surveyor, and contractor, and certainly no less so to the client whose money is expended.

Just allow me to add, by way of inquiry, whether the system of receiving open in place of sealed tenders as a rule is not worthy of consideration, and whether, if such a course became general, important and beneficial results would not accrue to all parties?

I trust, however, that the day is not far distant when the profession will universally adopt one general code of regulations on these and all other matters for which some recognised mode of dealing is now considered necessary.

H. J. Brown.

LEEDS WORKHOUSE COMPETITION.

The subject of architectural competitions has already occupied so much space in the columns of the *Builder*, that you may, perhaps, consider that your readers have had enough of it: it is, however, one of such real importance, both to the profession and to the public at large, that I think it should not be allowed to rest in its present very unsatisfactory state. But to effect any improvement, the profession must do something more than make speeches and write articles: every individual member of it must honestly and consistently abstain from sending drawings in competition, unless the conditions proposed are fair and honourable: this would be a much better course than that of abusing committees for decisions, the injustice of which ought to have been expected, either from the ignorance or unfairness exhibited in the instructions. I will not, however, occupy your space by reiterating general statements, the force of which all admit, but which few, if any, act up to; but will ask your attention to the conditions contained in the enclosed instructions to architects purposing to send designs for the new intended workhouse at Leeds, viz.—"Architects are required to furnish a complete set of plans, sections, elevations, explanatory and *working drawings*, accompanied by a general and *minute specification* of the manner of executing the works, *sufficient for contracting for the same*, and an estimate of the cost *in detail*" &c.; or, in other words, architects are to furnish all the documents and information necessary to enable the clerk to the guardians, who is, of course, a lawyer, to make a binding contract with a builder to erect the building required, and thus, with perhaps the assistance of a clerk of the works to superintend the erection, the worthy guardians have no doubt shrewdly calculated that they may save the expense of an architect, and even lay claim to a character for liberality, by offering, as *premiums*, about one-fourth of the amount which the architect legitimately employed would be entitled to. It may perhaps be thought that the above conditions are framed in ignorance, but I have reason to think that such an excuse cannot be offered in extenuation. In writing to inquire as to this competition, I took the opportunity of asking whether, in making a selection from the designs sent, the guardians would avail themselves of professional assistance; also whether the author of the design selected as the best would be employed to carry out the work. The reply to these questions from the clerk to the Board is,—"I think there is no thought, on the Board of guardians' side, of adopting the course you refer to in reference to superintending the building of the new workhouse." If, after this candid avowal, the competing architects should be dissatisfied with the decision which may be made by the Leeds guardians, they can only lay the blame on their own shoulders, and will not be able to say they were not forewarned by

Non-competitor.